

# INTERFACE AGE™

COMPUTING FOR HOME AND BUSINESS APPLICATIONS VOLUME 3, ISSUE 11 NOVEMBER 1978 \$2.00  
CANADA/MEXICO \$2.50 INTERNATIONAL \$3.50

**INDEX TO SOFTWARE  
IAPS NOTEBOOK**

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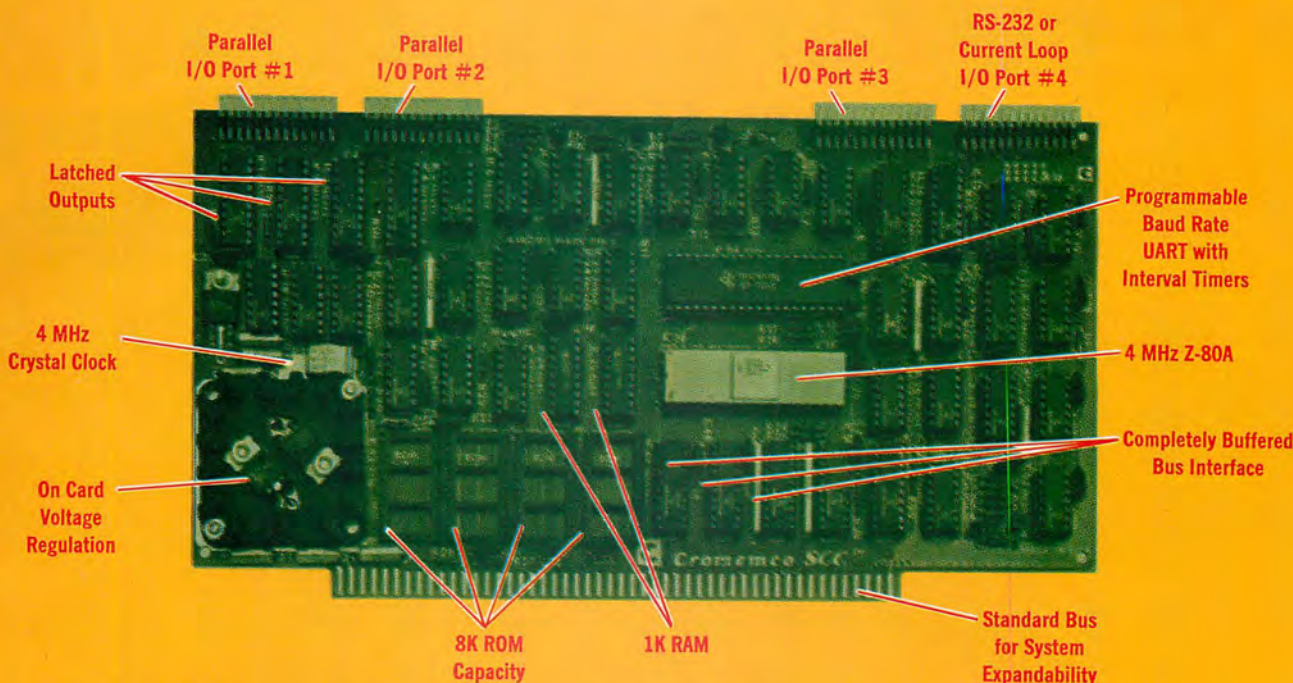
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The computer itself is super. Fast 4 MHz operation. Capacity for 8K bytes of ROM (uses 2716 PROMs which **can be programmed by our new 32K BYTESAVER®** PROM card). There's also 1K of on-board static RAM. Further, you get straightforward interfacing through an RS-232 serial interface with ultra-fast speed of up to 76,800 baud — software programmable.

Other features include 24 bits of bi-directional parallel I/O and five on-board programmable timers.

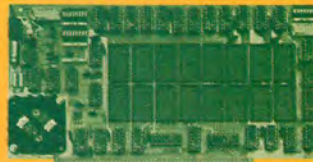
Add to that vectored interrupts.

## ENORMOUS EXPANDABILITY

Besides all these features the Cromemco single card computer gives you enormous expandability if you ever need it. And it's easy to expand. First, you can expand with the new Cromemco 32K BYTESAVER PROM card mentioned above. Then there's Cromemco's broad line of S100-bus-compatible memory and I/O interface cards. Cards with features such as relay interface, analog interface, graphics interface, optoisolator input, and A/D and D/A conversion. RAM and ROM cards, too.



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### THIS MONTH'S COVER

Have you ever wanted to build castles in the sand? That is just exactly what we did this month for the cover. The idea is to portray software with the juxtaposition of the sand, sea and the last glows of day.

The cover was designed by Fino Ortiz, Art Director; photography by Shelley Wright. The disks and cassettes were supplied by the Westminster Byte Shop and the keys were courtesy of Datanetics.

# INTERFACE AGE™

COMPUTING FOR HOME AND BUSINESS APPLICATIONS

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**In the midst of the  
talk and the promises...**



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**Peripherals a  
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# EDITOR'S NOTEBOOK

**MANUFACTURERS/RETAILERS  
YOU SHOULD READ THIS**

Some of you who know me are aware that I spent a number of years in the airline industry. As a result of this tenure, I learned how things are supposed to work on a grand scale. To bring this around to what I will be proposing let me explain basically what happens within the airline structure.

An airline relies on passengers to supply the revenues that keep the airline in business. The airline is governed by the Civil Aeronautics Board (CAB). This agency establishes the rules and regulations that the airline must follow, and acts as a clearing house for consumer complaints against the airline.

Along with federal regulation are agreements made between airlines that come under the heading of trade practices. The trade practices cover everything from what airline A must do when transferring a passenger to airline B, to which airline is responsible for what mistake.

All very concise and laid out. The prime purpose, on the surface at least, is to assist the traveling public.

However, in real life encounters a passenger becomes upset with an airline and complains. The complaint, in most cases, is a letter to the airline and the CAB. The upset passenger is under the impression that the CAB will crack the airline's knuckles and make everything alright.

This is really not the case, since the airlines are not that afraid of the CAB. But they will answer the letter and fill out a form for the CAB and another hash mark goes on the tally. Everyone is satisfied except the upset passenger.

Now suppose the upset passenger has been around for awhile, and really realizes that his or her letter will only cause the production of a form letter. This passenger will send the letter to the CAB and the media. The response to the letter from the airline will be quite

different than the one sent only to the CAB.

The point is that airlines, or any big business, are relatively unafraid of regulatory agencies. But they are extremely afraid of poor press — airing their dirty laundry, so to speak.

Now how does this diatribe relate to our industry? Primarily the relationship of the power of the media, magazines serving the industry to be exact.

During the past several months I have been asked to assemble a list of all the bad guys and the good guys and publish it within the pages of INTERFACE AGE. This is something that is totally impossible to do, since it would be based on supposition and could cause a potentially good company to bite the dust without having a fair chance.

There is something that can be done, and that is to respond to letters of complaint in a formalized manner. This is exactly what INTERFACE AGE has been doing and will continue to do. However, to do this some ground rules must be laid out.

First the letter of complaint must be businesslike, with no name calling. The letter must explain the situation: what the exact problem is, who the company is, who was contacted and when and by what means, and the response given. Also why the response was not satisfactory to the writer. The letter must contain the writer's true and complete name, address and telephone number, and an indication that a copy was sent to the company in question.

When the letter is received at INTERFACE AGE, it will be copied and sent to the manufacturer/retailer involved, along with a letter requesting an immediate reply be sent both to us and the writer.

We will make every effort to follow up on these letters to ensure a reply, and hopefully one to the satisfaction of the writer.

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```

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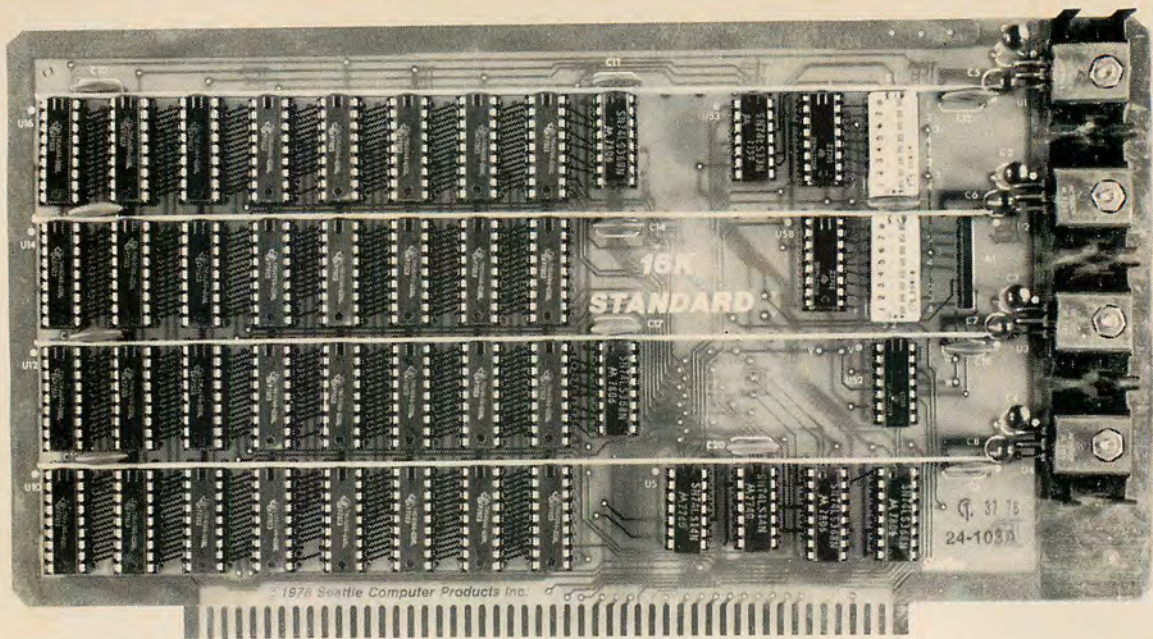


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Contains a complete description of our products including the recently announced 16K PLUS premium RAM which is ideal for Cromemco systems (see

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**Guarantee:** Kits — All parts guaranteed for one year. Factory assembled units for USA customers — Both parts and labor guaranteed for one year; ten day return privilege. Factory assembled units for foreign customers — parts guaranteed for one year; no return privilege.

**Direct Factory Orders** — you may phone for VISA, MC, COD orders. (\$3 handling charge for COD orders only). Purchase orders accepted from recognized institutions. Personal checks OK but must clear before shipment. Shipped prepaid with cross-country orders sent by air. Shipping — normally within 48 hours. Washington residents add 5.4% tax. Our 16K STANDARD and Premium 16K PLUS board are also available through most computer stores.



**Seattle Computer Products, Inc.**

1114 Industry Drive, Seattle, WA. 98188  
(206) 255-0750



Now turn about is fair play in the consumer game, so if manufacturers or retailers have customer difficulties, they have the same avenue open to them. Of course, readers will have the right of response.

Now regarding the area of trade practices. As mentioned, this is something that is used by the airline industry and many other overlapping industries to establish set rules to solve industry problems. It is something that is definitely needed in our young industry.

What I would like to see is some of the self-proclaimed industry gurus and mucky mucks really make an effort to work with the Federal Trade Commission and interested parties to develop exact trade policies. The benefits would be enormous for both the buyer and seller. The ability to set agreed-upon standards from bus design to software would become so much easier.

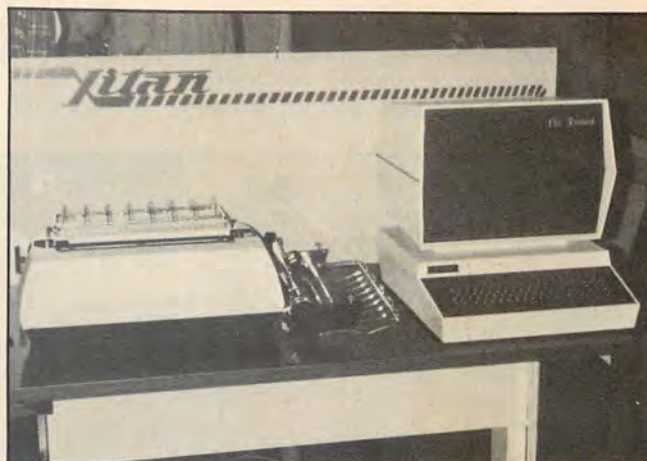
Of course any trade organization membership would be voluntary, at least at first. But the credibility factor that it would add to a company would be worth it.

### JOHN DILKS IS A HAPPY MAN

John Dilks, the Santa Claus of the microcomputer industry, has every right to be as happy as a man can be. His Personal Computer Convention, held in Philadelphia this August, turned out to be possibly the best convention held so far. Attendance far exceeded everyone's expectations and the seminars were better attended than those held at NCC. Attendees were in the mood to see, learn and pass on information to other computer enthusiasts.

### AT THE SHOW

The General™ was introduced by Xitan. It is a complete system geared for the businessman and is available now through any Xitan dealer.



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## MSD INTRODUCES THREE NEW SOFTWARE PROGRAMS



**CRAS™** is a Register Accounting System by O.E. Dial featured in Personal Computing, August 1978. It is an integrated single entry system that produces a check register, statements of accounts, reconciliations and printed checks for only \$75.00. **FORMAT** is a text formatting program which processes files for the CP/M™ editor. Especially designed for the generation of letters, reports, or any material requiring a formal appearance, FORMAT may be executed on any CP/M disk operating system with a minimum of 16K bytes of memory and purchased for \$45.00. **MP/C™** allows Altair Disk owners to run CP/M based software on their **ALTAIR DISK** for only \$75.00. Of course, we still offer CP/M for \$100.00 and Microsoft BASIC for \$180.00 which includes MSD's own MBASIC manual.

Still available at \$525.00 is the **MSDD-100 Floppy Disk System** combining a well designed LSI controller board with a Shugart SA-400 drive to give a very fast 80K bytes per drive on line for your S-100 bus computer system. Included is a flexible utility package and a complete **DOS** is available at \$30.00. Also, the **MSDV-100 Video Display System**, a two-board S-100 bus compatible, memory mapped device with a 80 x 24 format and programmable character generators is offered at \$299.00. Assembled units at \$100.00 additional cost.

**DISKETTE SPECIAL**—For a limited time only! Soft sector, 5 inch at \$42.50 per box of ten. Soft sector and 32 hard sector, 8 inch at \$40.00 per box.

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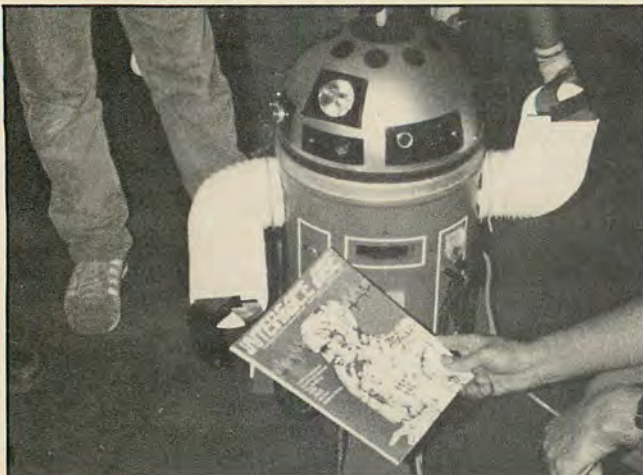
Another exciting and busy exhibit was the Alpha Micro booth. The folks from Alpha Micro were exhibiting their AM-100 with full size disks and very impressive software. We have arranged to do a story on the system for a later issue.



The nice looking folks in the picture are Dr. Gerald Orosz and his wife Barbara. Gerald is the president of the Physicians Microcomputer Club and publishes an extremely fine magazine geared specifically to the medical world and micros.



The tired looking fellow in this picture is Bob Stevens of Technico. That's the other 16-bit computer company. The Technico system is built around the Texas Instrument 9900 microprocessor, and is a multifaceted machine. Technico has pretty well defined its place in the industry, and is planning to provide micros for industry and education. Both are big fields and Technico has some really exciting plans in the works which will be announced early next year.



What would a computer show be without robots? Well, PCC didn't have to find out. Robert Profeta, a 15-year-old New Jerseyite, was on the scene with his metal marvel called SB3402. This is Robert's third creation, and as you can see a pretty smart one. At least he knows where to find out about his friends.

## THIS MONTH'S COMPANY PROFILE



SORD USA is a Kansas City, Missouri based distributor of the Japanese made microcomputer system called the M222. This system comes complete with 64K bytes of memory, BASIC and is S-100 bus compatible.

SORD began operations earlier this year as part of SORD-SUNSTONE, with a plan to invade the already established micromarket in the United States. However, due to some initial technical difficulties, and importing problems, the company has just recently gotten into full U.S. operations.

The M222 system, according to Bob Chambers Jr., Executive Vice President, is planned and marketed as a complete business machine with a built-in 5.25 floppy disk drive as one of its main features. The drive controller is designed to support up to three drives at a time. The M222 has a standard RS 232 interface and is supported by highly sophisticated systems software, with more being made available by early fall and January of next year. SORD USA has also begun establishing a nationwide dealer network, and is presently working with software designers to develop applications packages for a total system product.

They also market the M100 microcomputer which is less than \$900 for the low end user. Both the M222 and M100 are high technology items and utilize the Z-80 CPU.

From all appearances the SORD system seems to be a promising one, and with the marketing skills of Bob Chambers is assured of achieving a large part of the small business market share.

For retailers and end users who are interested in finding out more about the total SORD line contact Robert Chambers, Jr., Executive Vice President, SORD USA, Inc., International Trade Center, 8300 N.E. Underground Drive, Kansas City, MO 64161 or phone (816) 454-6300.

## PANDORA'S BOX

In the August Editor's Notebook I asked to hear from anyone engaged in the microcomputer consulting business. I really opened Pandora's box. To date I have received over 150 letters from so-called consultants, most of which caused me to have severe stomach traumas.

The letters arrived on everything from professional letterhead to scraps of paper found in parking lots. This, of course, said a lot about the individual's credibility as a consultant.

But as promised here are some of the consultants who answered the call, and appear from the provided information to be worth talking to.





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FEATURING AN IEEE-488 BUS

The PET, unquestionably, has become the standard for the personal computer industry. As such, consumer and business publications have lauded its discovery. It comes out of the box, plugs into the wall, and is ready to use.

#### IN A LEAGUE WITH IBM, HP AND WANG MINICOMPUTERS

The fully integrated PET is a minicomputer and should not be confused with game products that hook up to household T.V.'s. What sets it apart from other computers is price. While others cost from \$11,000 to \$20,000 and more, THE PET, with similar power, is only \$795.00.

It is of sufficient size and speed to accomplish many of the routine computational tasks facing engineers and scientists. By combining an extended BASIC interpreter with one of the fastest microprocessors available, Commodore has created an incredibly capable, yet inexpensive, computer.

#### POWERFUL 6502 HARDWARE:

The mind-boggling PET has all necessary functional elements packaged in a single cabinet. Its CPU is a MOS Technology 6502 8 bit microprocessor which can address 65,536 bytes of memory directly. It has 56 instructions and 13 different addressing modes. Depending upon address mode, instructions are executed in 2 to 7 microseconds. The unit has 9216 bytes of random access memory (RAM) and 16,384 bytes of read only memory (ROM). 1K of the RAM and 2K ROM are used for video display. 1000 characters, organized in 25 rows of 40 columns can be displayed at a time. An 8 x 8 dot matrix delivers superb CPU readability. The character set consists of 158 upper and lower case letters, numerals, punctuation symbols and a variety of graphics characters.

#### INCREDIBLE FIRMWARE FLEXIBILITY

The firmware's three primary components include the operating system, full screen editor, and BASIC interpreter. Together these programs use 14 K bytes of read only memory.

#### DIRECT ACCESSORY PLUG-IN

The unit's operating system permits you to easily load and save programs. One of its exclusive features is complete support for the IEEE-488 instrument bus, which is occasionally referred to as an HP-IB bus. This bus provides superb flexibility. Through it, you can connect up to 12 devices to the PET, at the same time. This universal port permits direct connection of the PET Printer, in addition to a wide variety of measurement and control instruments such as counters, timers, spectrum analyzers, digital voltmeters and printer plotters, from HP, Phillips, Fluke and Tectronix. Many academic, industrial and governmental labs are already using PETS as laboratory automation control computers.

With the PET's full screen editor, an entire program, a selected section, or a statement can be listed. The cursor can be moved as needed on the screen, and characters can be changed, inserted or deleted to modify any program statement. Statements can be copied or moved by changing their line number. New statements can be added, or old deleted, as desired.

#### COMPLETE COMPUTER PERFORMANCE

The BASIC interpreter enables a superset of the original BASIC. Among its major features are floating point, integer and string arrays of limited dimensionality, dynamic string handling, 5 byte floating point number representation (for approximately 8 decimal digit accuracy), PEEK and POKE commands for direct memory access, two character variable names, full support for IEEE-488 bus devices, program chaining with full data retention between overlays, built-in mathematical (ABS, ATN, COS, EXP, INT, LOG, RND, SGN, SIN, SQRT, TAN) and string (ASC, CHR, LEFT, LEN, MID, RIGHT, STR, VAL) functions; user-definable functions; multi-statement lines; real-time clock; support for machine language subroutines; both character and line input capability.

#### HIGH SPEED PET PRINTER

This powerful word processor prints hardcopies, invoices, computer correspondence. Faster than an IBM Selectric, The PET Printer delivers 60 characters per second at a sustained rate -- with upper and lower case capability. Characters are one-eighth inch tall and are printed in a large 8 x 7 dot matrix. The printer uses a standard 8 1/2" wide paper roll. And, it is only \$695.00.

#### PERIPHERAL SECOND CASSETTE

This optional component expands storage, increases flexibility, and is just \$99.95.

#### SOFTWARE

Application programs for the PET can of course be written by the user, and most special purpose programs will be so written. A growing library of programs is already available.

#### PROGRAMS AT \$29.95 EACH:

☐ **Basic Math Package:** Matrix operations-entry, editing, addition, subtraction, multiplication, inversion, determinants, solution of simultaneous equations.

Vector operations-entry, editing, addition, subtraction, dot and cross products, length, angle between vectors.

Plane and spherical trigonometry-calculate sides and angles of triangles, areas of regular polygons.

Numerical integration and differentiation-active entry, editing and display of data; Simpson's rule, trapezoidal method and Gaussian quadrature integration algorithms; differentiation allows arbitrary interval size.

#### ☐ Basic Statistics Package:

General statistics-calculates mean, median, standard deviation, skewness, kurtosis, frequencies, range, and variance of a data set.

T-tests-to determine the significance of a difference between the means of independent groups, matched groups, mean gains of paired groups, known and observed means and means of sample proportions. Chi-square test for independence between two statistical processes.

Correlation and regression-calculates Pearson product moment correlation coefficient and the regression line.

#### PROGRAMS AT \$24.95 EACH:

☐ **Basic Investment Analysis:**

Loans, annuities, return on regular and irregular sequences of payments, calendar calculations.

☐ **Stock Portfolio Recordkeeping and Analysis:** Keeps track of buys, sells, and dividends. Calculates current value, rates of return.

☐ **Checkbook Recordkeeping and Analysis:** Keeps track of checks and deposits. Analyzes expenses by date and type.

#### PROGRAMS AT \$14.95 EACH:

☐ **Mortgage Analysis**

☐ **Diet Planner and Biorhythm**

☐ **Basic Basic-by Lodewyck and James**

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☐ **Osero, Reverse** ☐ **Spacetrak** ☐ **Kingdom**

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Because your PET is self-contained and compact, professional factory service is never far away. If major service is required, the unit can simply be returned by UPS to an authorized Commodore PET clinic.

To order your PET send check or money order for \$795.00 plus \$20.00 for shipping and insurance. To order the PET Printer, add \$695.00 plus \$12.00 for shipping and insurance. The Second Cassette is \$99.95. No shipping and insurance charges are required for the second cassette or programs when ordered with your PET. Credit card orders are invited to call our toll free number below. Orders will be accepted on our Telex, No. 25-5268.

Use THE PET for 30 days with no obligation. If, for any reason, you are not satisfied, return it for a prompt and courteous refund.

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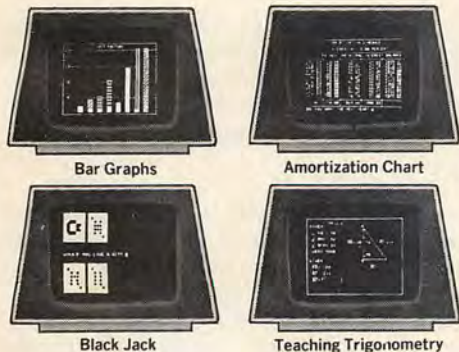
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## Contemporary

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All characters can be displayed in normal mode - white on black, or reverse - black on white. Since the display is part of main memory, it can be accessed directly by the CPU. Flexibility is enhanced by the full screen editor. Input is either from the 10-key numeric keyboard, with its full cursor control, or the built-in cassette tape drive. All symbols used in BASIC statements are available in the unshifted mode for added operating speed. The cassette can be used to read and write programs and data at 50 bytes per second. A second cassette port, 8 bit parallel I/O port and IEEE-488 bus port are also provided. The entire system weighs 38 lbs. and measures approximately 15 1/2" high x 17 1/4" wide x 18 1/2" deep.

The PET is completely silent in its operation. No special installation is necessary because it operates on ordinary 110V household current at 50-60 Hz.



Ashok K. Nagrani, an INTERFACE AGE author, specializes in the field of developing management information type systems for travel agencies and apartment houses — mainly record keeping. He can be reached by writing to Ashok K. Nagrani P.E., 225 Corinth Court, Roswell, Georgia 30075.

The next consultant on the list is Mark Skinner, the owner of RES IPSA LOQUITUR — which translated from Latin means "The thing speaks for itself." Mark specializes in helping businesses determine how to get the most out of their data processing dollar, and helping companies decide whether or not to computerize. Mark can be contacted by writing or calling RES IPSA LOQUITUR, 2141 Violet Street, Sacramento, CA 95825, (916) 929-4273.

And from middle America we have Joe Montgomery of CCA — Computer Consultants of America, P.O. Box 462, Anna, IL 62906. CCA is primarily interested in pursuing business in three major areas: small businesses needing first time computer facilities, the medical/legal professions, and custom hardware and software design.

Coming back to California, we have Jerry G. Hawks, Southwest Computing and Consulting, 211 Skipjack Lane, Oceanside, CA 92054. Mr. Hawks is an independent consultant specializing in small business systems and computer science education. He is presently developing a wide range of software for the Radio Shack TRS-80.

Dataset, 9880 Estaban Way, Tujunga, CA 91042, phone (213) 353-4421, was represented by Bob Goin who in his letter explained that they are in the consulting business to provide the potential user with help in hardware and software selection, contract programming and system analysis, and providing low cost packaged software.

Mike Flynn has started a small consulting firm called Personal Systems Consulting, P.O. Box 20286, El Cajon, CA 92021, phone (714) 443-5353. Mr. Flynn is a professional DP'er and provides services to implement small systems into specialized applications, along with developing small computer systems.

Still in good old sunny California, we find Arthur J. Stoll the business manager of A & M Computer Services, 1040 River Drive, Norco, CA 91760. This firm specializes in developing business software and is presently utilizing the Commodore PET.

Now still in the west but a little farther is Charles S. Portwood, Ph.D. of Research Consulting Inc., 2270 Ahamele Place, Honolulu, Hawaii 96821, phone (808) 737-5857. Dr. Portwood is into various types of business consulting, and has a turnkey computer business. Dr. Portwood presented a most interesting idea in his letter: a nationwide organization of computer consultants. Gee, I think I said something like that — trade practices maybe?

Now on the other side of the country is a firm called Micro Logic Corporation, headed up by James Lewis. This company is into business consulting and apparently mail lists. Mr. Lewis can be reached by writing or calling Micro Logic Corp., 100 Second St. #213, Hackensack, NJ, phone (201) 342-6518.

What is important to note is that the consultant business is growing, and like all growing businesses some less than capable people will slip in — possibly even some dishonest ones.

Because we have published a consultant's name does not mean that we are saying he is good, bad or indifferent. The ones we chose not to publish are, in our opinion, less than professional at this point in time.

For those of you who are looking for consultants, I suggest that you follow these short guidelines:

- Ask for references from previous clients.
- Ask for examples of the type of work that will be performed — a portfolio.

- Ask leading questions such as: "How long will it take to do the specification?" You will be surprised how many consultants have never heard the word.
- Ask to see examples of previous specifications.
- Does the consultant provide a preliminary prospectus and a contract?
- Does he dazzle you with his fancy footwork and buzz words?

These are only some of the things that are important to look at, and believe me there are hundreds of things you need to ask and know. One good rule of thumb to follow is: if you are uneasy with the consultant, don't use him. Your first inclinations are probably the right ones. Also check with your lawyer to see if you have any recourse if the consultant is unable to deliver.

## WHO IS THAT BEARDED MAN?



Some of you who stopped by our booth in Philadelphia saw what you possibly thought was a new face on the staff, but that's Mike Antich. Mike has, for the past two years, been the production manager and was just recently promoted to marketing manager. Mike is our liaison to the advertisers, and our resident information collector. Mike spends a fair amount of his time collating useful marketing information and providing us editorial folks with possible story leads.

So the next time you are at a show, look for the fella in the picture, but in a three piece suit and without the can of punch.

## CHANGE IN FORMAT

Many of you are aware, or at least have an idea that software listings are sometimes hard to read. We have developed a format change which is effective with this issue. This format will allow better definition and in most cases allow us to print a listing at 100%.

## STOP AND TAKE A MINUTE

All too often we get involved with what we are doing and forget that we have friends and real time, real life problems and situations. We forget that there is more to life than computers, business and magazines.

One such situation is that of Bill Langene's eight-year-old son David, who underwent closed heart surgery in early September. David is fine, happy and in school. Bill and his wife are breathing easier and things are back to normal in the Langenes household.

Now what would really be nice would be to drop Bill a note and say: "Hey, Bill, glad to hear David is fine, everything is great here and it's a wonderful day." If you feel the urge, drop Bill a note care of Computer Retailing, 2817 N.E. 14th Avenue, Portland, OR 97212.

carl

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# THE COLUMN



By Sandra Evans, Contributing Editor

Recently I was faced with that long anticipated moment, my vacation, and I wanted to accomplish that seldom attainable, near miraculous feat everyone longs to accomplish but seldom does. I wanted to leave my job at the office where it belonged and rest without one thought, one afterthought, of my work.

This seemed nearly impossible, however. After all, a contributing editor to a computer magazine is obviously reminded daily of the technical world. But I was determined. So one beautiful August day I, swimsuit in one hand, favorite friend in the other, drove with determination to Los Angeles Airport, boarded Mexicana Airlines, and after a short prayer for a safe landing, settled down to an abundance of champagne. When my 727 landed, I found myself in tropical, lush, green Puerto Vallarta.

I looked forward to that mindless, casual, mañana feeling my mind soon eased into and my entire body geared down into s. . . l. . . o. . . w motion. Anything could wait, and it did. In fact, there really wasn't much to speed it up. Puerto Vallarta is not a mechanized, computerized, electrified city. Puerto Vallarta is a small, white washed, quaint town gently drifting on cobblestoned streets. It is timeless, lazy and just what I wanted.

But I soon realized the difficulties when encountering a different culture. I first had to cope with the lack of television or telephones. When I resolved that problem, there were others to face.

The most difficult problem occurred the first day I took a taxi into town when I again found myself automatically depending on mechanization. For a city lady, no meters in the taxis and no street lights on the corners can make any ride an insecure one. After all, how many of us have justified the outrageous driving habits of the universal taxi driver by the mechanical clicking of the meter; and haven't we all depended on the computerized traffic light to temper that driving with some amount of sanity? But with the right frame of mind, I realized after one ride that driving on cobblestones must really be fun in the rain, and any taxi driver is likeable if you carry the exact change. . . in pesos.

Converting to pesos naturally is a must, and though I never really could whiz the calculations through my head, I did manage enough to become proficient in haggling with the shop keepers. It was interesting to note, however, the number of tourists who most assuredly suffered culture shock. They were the ones punching away on their pocket calculators each time the word "pesos" was uttered or throwing up their hands in disgust when they realized no one used the latest NCR registers.

Even though my relaxation did begin without those plaguing thoughts of work, I must admit it took the full eight days to appreciate and live in such a simple, non-technical world. By the time my vacation was over, I had become so used to living in slow motion, I wasn't sure I could ever speed up again. When it was time to leave, I taxied to the airport with some apprehension. I was going home. □

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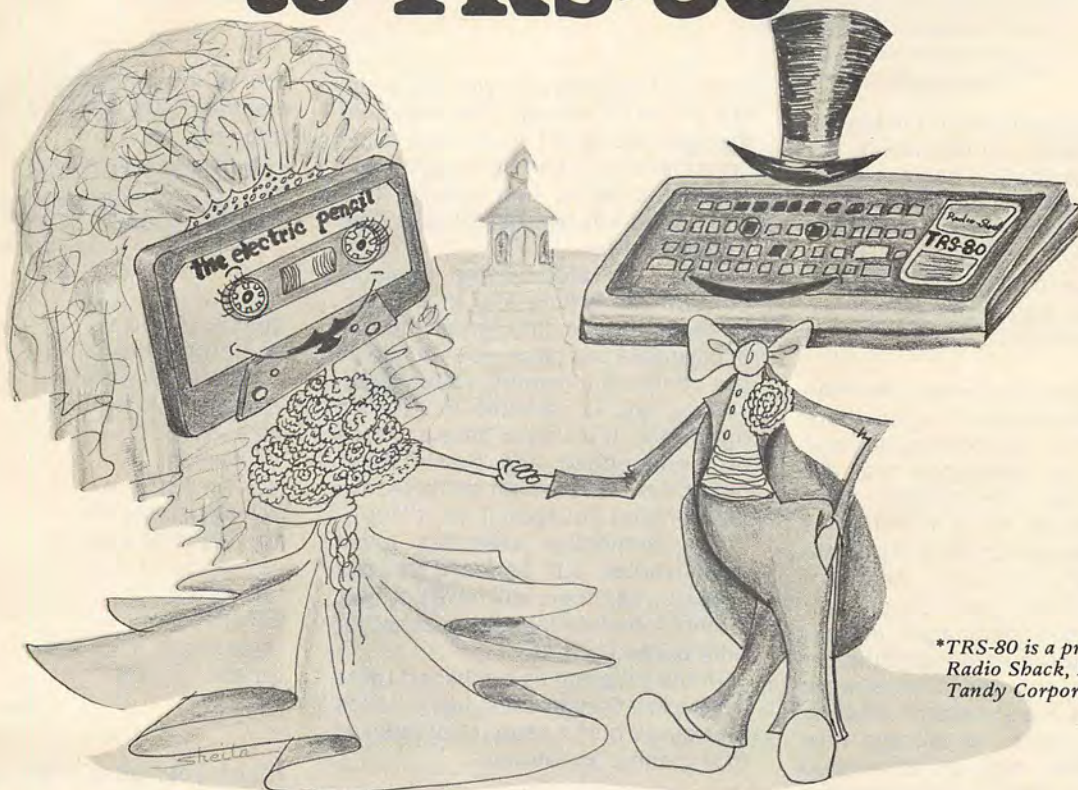


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NOVEMBER 1978

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**m  
ss**

**MICHAEL SHRAYER SOFTWARE, INC.**  
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Glendale, CA 91205



# LETTERS TO THE EDITOR

Dear Editor:

A.A. Perez's editorial in the March, 1978 issue goes a long way in the right direction, but he has not given microcomputer languages the attention they deserve. I think structured programming is a good idea, no matter what type of machine is used, and that the languages should be developed which can support it naturally.

Although my experience has been mainly on large systems, I feel there is a gap in the capabilities of most microcomputer languages that are widely in use. One mostly finds various BASICs, some FORTRANs and an occasional COBOL. As a happy exception, I recently heard of PASCAL coming out. Except for PASCAL, these languages do not support structured programming per se, although one can always work out problems in a structured manner.

I should like to encourage new languages that support structured programming for microcomputer programmers. Highlights of such structured languages would be the following:

1. Control structure limited to straight sequence, IF-THEN-ELSE, DO-WHILE, DO-UNTIL, and the CASE.
2. Blocks: The language must be able to handle a block of statements wherever one statement can be used.
3. Local Variables: One should be able to declare variables whose life span is from entrance to exit of a block and are not available to other blocks.

Daniel H. Miller  
103 Beethoven Avenue  
Waban, MA 02168

*Mr. Miller, I think the industry agrees with you. We are publishing your address so interested parties can contact you.*

Dear Editor:

Peter Burke and you are to be thanked and congratulated for being the first I know of to produce a fine working program for general use for almost every compound-interest

need (A Financial Analysis Program, March 1978 issue). The required thought and effort must have been considerable. The program will remove some of the mystery that compound interest has always held for most of us.

I like the step-by-step explanations in the article and in the program, and the facility for a schedule of payments and balances. A schedule is a convincing demonstration of accuracy, and is valuable in its own right. Also, it's nice to have a choice of starting-point and finish. Peter didn't mention his neat and effective rate-refining equation (Line 1750).

The numerous examples given have worked out perfectly on our 8080 but, as others will have noticed, a long schedule takes time whether fully printed or not.

In the program as published there were a few transmission-line glitches that could hurt a little if not seen at first glance, as follows:

Line	Suggested Version
490	IF K1 equals 2
2080	IF I is less than A.....
2200	02 equals C minus 03
2250	PRINT I, FNA(02), FNA(03).....

You will know that "In" appeared in the article but should have been "Log". Incidentally, any kind of Log will do.

I hope that Mr. Burke will surface again, and that others will follow his fine initiative. Personally, I like application programs with some math. I believe that math, business, and computers are a combination that we hobby-riders haven't seen enough of.

W. F. Locke  
Ontario, Canada

*Mr. Locke, we and Mr. Burke appreciate your comments.*

Dear Editor:

A friend and I have built an Apple computer. We wrote a simple program we would like to share with other Apple owners. To our knowledge this is an original program. If we have unwittingly duplicated, we apologize. This program can, of

course, be expanded to full screen graphics. Try it. The results are splendid.

## GRAPHICS PROGRAM

```
1 REM; COPYRIGHT ROB DINNELL AND
  MIKE TAUTKUS 2/15/78
5 REM; APPLE II COMPUTER —
  GRAPHICS MODE
10 GR
20 FOR X=0 TO 39
30 COLOR=RND (16)
40 VLIN=RND (39)
50 HLIN=RND (39)
60 X=VLIN
70 X=HLIN
80 VLIN 0, 29 AT X
90 HLIN 0, 29 AT 39-X
100 VLIN 10, 39 AT 39-X
110 HLIN 10, 39 AT X
120 PRINT X,
130 NEXT X
140 GO TO 20
150 END
```

Rob C. Dinnell  
Capitola, CA

*Thank you, gentlemen. I know our readers will enjoy it.*

Dear Editor:

In accord with your name. . . We would appreciate info about interfacing Friden 7 level Flexowriter with the PET 8K. The mechanical-electronic would help, but more importantly, the matrix logic for transposing 8 level to 7 level. Thanks.

Your magazine has been a great help to a novice such as myself. Keep it up, but keep it relatively simple.

Suggestion that terms and abbreviations be regularly explained. Granted as a person progresses, he learns these terms, but I am sure that you hope for a continuing increase of learners subscribing who need this type of educational assistance. I am sure your old-timers will understand and be patient.

Jack Weaver, Pastor  
Palmetto Bible Chapel  
16255 S.W. 82 Avenue  
Miami, FL 33157

*Readers, can you help them out?*

Dear Editor:

I would like to comment on your magazine and the BASIC language.



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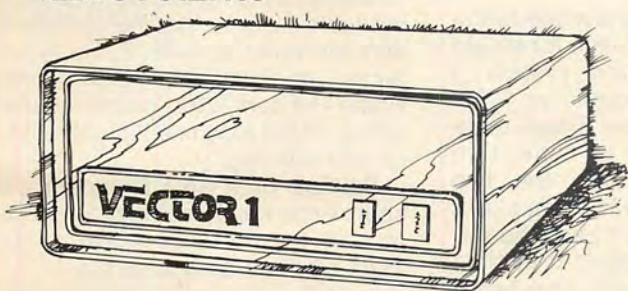
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First of all I want to mention that you have a fine magazine. However, I feel that most of your articles now are to recruit new hobbyists. Also I want to mention that almost all of your programs are written for floppies. What about the guys who don't have them? I haven't seen a Phi-Deck program yet. I think that most owners don't have floppies and that we are overlooked.

I personally look to the magazines for articles and help on building my software library, and to get help in my programming. I don't have much time for study and to work my software because I'm too busy making a living as a mechanic.

Now a word about BASIC. I like BASIC and I would like to see it become the universal language. My proposal is that your magazine become the focal point for writing a BASIC from scratch. By this I mean that you should take all the features of all BASICs and then write one command at a time and explain how to make it work on all CPUs. I believe it would be like a small subroutine for each command like for List, run, etc. These would have to be explained in detail and shown how they can be converted to each micro in machine language. This BASIC would have to be upgradable as a user goes from audio to digital to floppies.

I believe that if we had a universal BASIC like the Ham's have their Morse Code the micro's would become more popular, also a network would become a reality. I'm sure that you could get a company to donate a BASIC like Altair, or have enough talent to generate your own. How about a government grant. I know that it won't make everyone happy but the majority will benefit. It will also sell a lot of magazines and if nothing else it will make a lot of people familiar with the insides of the BASIC language.

Frank M. Goeringer  
Cahokia, IL

*Just keep watching. We have some surprises.*

Dear Editor:

I have lost information on a graphics display system. This system had a resolution of 256 by 256 points. It

is programmed through I/O ports, several could be hooked together for color, and is only one board.

It came (comes?) with software to plot lines, points, and blocks. One of the programs had a person walking, and swinging its arms. The price was from \$300-\$400. Do you know what I'm talking about? What is it? I need HELP!

Simson Garfinkel  
18 Darthmouth Lane  
Haverford, PA 19041

*I'm not sure, but it sounds like either an Apple or VideoBrain.*

Dear Editor:

Could you please help me with a question or direct me to someone who can?

I have two Borroughs made terminals and logic units made for an airline ticket reservation system. I would like to use these in an S-100 bus system if possible. These units are BCD so I need to convert to ASCII, or do I? I have the two manuals that come with them plus a sheet on conversion. If I had the wiring diagram I could build it or trouble shoot it. Also would it be better to do this in hardware or software?

Thanks for any help you can give. Enjoy your magazine very much.

Walt Sroka  
2102 North Oakland Avenue  
Decatur, IL

*Walt, you have a job on your hands. I have seen the units advertised and even have worked on them in an airline environment, but never have run across anyone who had converted one to ASCII. Maybe one of the readers can help.*

Dear Editor:

I am using a TRS 80 in my business. I find most of the Radio Shack personnel in the retail stores are not really very knowledgeable at software or tech information.

Since the Company is not putting out information at a speed or level of my need I wondered if you have anything on their Level II conversion.

We have the 16K unit, and are able to do most of our applications without difficulty as long as I write my own programs.

My question would be is the Level II going to be of help to me? And, secondly do I have to use their printer or can I interface one of the IBM typewriter types?

If you have any info on this I would really appreciate it.

Jack G. Hatfield  
2895 Bedford Avenue  
Placerville, CA 95667

*Jack, we will find out by letting out readers tell you. Hopefully someone out there can answer your needs.*

Dear Editor:

I recently purchased the "Black Box" printer advertised by Expander Incorporated, 400 Sainte Claire Plaza, Upper St. Claire, PA 15146.

The 80 column impact printer is available with a parallel interface and controller at \$396. It mates perfectly with the parallel I/O card in the Heath H-8 computer. Ten minutes to wire a 30 pin plug is all it takes to be up and running.

Delivery time from Expander was approximately 4 months. However, at \$396 the wait was worth it. This must be rated as a 'best buy.'

Laird Schearer  
Boulder, CO

Dear Editor:

There is an easier way to control the continuous "roll" on the TV display (reference, INTERFACE AGE, June 1978, page 155).

Insert:

```
105 IF INT(J/L)*L = J THEN INPUT "PAUSE";A$
95 L = 12 : REM - MAX. NUMBER OF
    LINES/PAGE
```

Test Problem

```
5 REM - TESTING T.V. DISPLAY CONTROL
10 L = 12 : REM - MAX. NO. OF LINES
20 FOR J = 1 TO 100
30 IF INT(J/L)*L = J THEN INPUT "PAUSE";A$
40 PRINT "LINE = ";J
50 NEXT J
```

To eliminate the double-key-stroke for "A\$", revisions:

```
30 IF INT(J/L)*L <> J GO TO 40
35 GET A$: IF A$ = " " GO TO 35
```

Michael Baltay

*We appreciate your input, Mike.*





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The ultimate personal computer is our 16-bit H11. Very few people will ever need more computing power than our H11 has to offer. Based on the world-famous DEC® PDP-11/03, it has enough capability for virtually any program—small business or hobby. The H11 offers unequalled software, too, so the number of useful applications is virtually unlimited. The H11 will soon have its own Floppy Disk System, the WH27. And what a floppy it is! Fully-compatible with the DEC RX01® floppy for the PDP-11/03, the WH27 lets you take advantage of all existing PDP-11/03 software in addition to those you develop on your own. Dual drives give you 512K Bytes of program and data storage. The WH27's Z80 microprocessor-based controller permits a head motion of only 6 mS (versus DEC's 10 mS) for data access times that are almost twice as fast. Other features include built-in self test on power-up; mechanical interlock to prevent disk damage; write protect function that precludes written-over disks; complete HT11 disk operating system software that includes extended BASIC with files and virtual arrays, utilities (with macro-assembler), text editor and more. An extended FORTRAN which supports the ANSI standard (1966 FORTRAN IV) will be optionally available soon.

Read more about Heath system-designed computers and other outstanding kits (nearly 400 in all) in the latest Heathkit Catalog. It's FREE.

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## MINI/MICRO SETS 30 SESSIONS FOR HOUSTON

A 30-session technical and business program has been scheduled for the Mini/Micro Computer Conference and Exposition in the Houston Astrodome, November 7 to 9.

Sessions will be presented five concurrently each morning and afternoon of the three-day conference. Session titles for the conference are as follows:

### November 7, Morning

1. How to Computerize a Small Business
2. Smart Communications for Mini-computer users
3. Semiconductor Impact on Computer Systems
4. Peripherals in OEM Systems — Looking Ahead
5. Networked Microcomputers in Process Control

### November 7, Afternoon

6. Practical Aspects of Audit Control and Security of Mini Systems
7. Distributed Computing — The Impact of AT&T's Advanced Communication Service
8. Future Hardware Technology in Small Computers
9. The New IBM Compatible Minis — Markets and Applications
10. Automated Materials Handling Systems: A Reality with the Micro

### November 8, Morning

11. From Service Bureau to In-House DP — And Vice Versa
12. Approaches to Computer Network Troubleshooting
13. How to Cut Software Development Costs
14. The New Generation of Fixed Disks
15. Micro and Minicomputer Applications to the Oil Field

### November 8, Afternoon

16. Keys to Success in Selecting and Installing a Minicomputer
17. Business Aspects of Minicomputer Distributorships
18. Pascal on Micros and Minis
19. Extended Disk Memory for Micros and Minis
20. Imbedded Microprocessors in Military and Industrial Systems

### November 9, Morning

21. Human Engineering Aspects of Data Entry — The Problems and Solutions
22. Business, Entrepreneurial, and Investment Opportunities in Minis and Micros
23. Applications Programming Languages
24. Minicomputer Tape Subsystems

## 25. Growing Impact of the Microprocessor on Computer Graphics

November 9, Afternoon

26. Word Processing — An Intelligent Approach with a DP Future
27. How to Get Started as a Small Systems Entrepreneur
28. The Future of Application Software for Minicomputers
29. Printers
30. Add-On Memories

## DATA 79

Data 79 computer and communications conference and exhibition, organized by ComputerData Magazine, will be held at the Queen Elizabeth Building, Exhibition Place, Toronto, Ontario, May 1, 2 and 3.

Over 100 exhibitors will occupy the 63,000 square foot exhibition hall, demonstrating various types of computer and communications equipment, products and services.

The concurrent three-day conference will highlight topics on network technology, distributed data processing and data communications. Emphasis will be on the user, discussing applications, problems and solutions.

For more information contact Kimberly Coffman, (416) 967-6200.

## NATIONAL OFFICE EXHIBITION AND CONFERENCE

The National Office Exhibition and Conference, organized by Canadian Office magazine will be held at Harbour Castle Hilton Convention Centre, Toronto, Ontario on February 13-15, 1979.

The three-day exhibition will provide a showplace for some 100 exhibitors in the areas of furniture, word processing, office computers and office equipment.

The concurrent conference is an educational forum to discuss problems in records management, office environment, space planning, word processing, energy conservation and many other topics of interest to senior management, middle managers and specialized supervisors.

For further information contact Kimberly Coffman, (416) 967-6200.

## STS CORPORATION ANNOUNCES ITS AUTUMN SCHEDULE

Scientific Time Sharing Corporation, Bethesda, Maryland, recently announced its autumn schedule of classes and seminars in APL applications. Financial planning, materials management, reporting, and database design and management

are among the applications to be covered in the classes. The schedule also includes multilevel courses in the APL language — from three-day introductory courses to advanced techniques seminars.

Classes will be held in major cities throughout the United States. STSC's international expansion has classes also scheduled in West Germany, France and England.

For further seminar information, contact Joan Gurgold, seminar coordinator, Scientific Time Sharing Corporation, 7 Holland Ave., White Plains, NY 10603, (914) 428-6910.

## NYU PRESENTS SEMINAR ON LASER TECHNOLOGY

Laser technology is the basis of a seminar, "Laser Technology: Fundamentals and Applications," presented by the New York University School of Continuing Education in three cities in the U.S. and Canada: January 11-12, 1979, San Francisco; March 22-23, 1979, Washington, D.C.; June 4-5, 1979, Toronto.

An intensive, two-day program, "Laser Technology" provides essential background information, guidelines for the applications of lasers and a discussion of the safe use of the laser in experimental or manufacturing situations.

The central purpose of the seminar is to present the significant "real world" aspects of the laser so that seminar participants can develop new technical capabilities for their company's specific needs.

For a detailed brochure and registration information contact Heidi E. Kaplan, Dept. 20 NR, New York Management Center, 360 Lexington Ave., New York, NY 10017, (212) 953-7262.

## DESIGN ENGINEERING CONFERENCE/WEST

The Design Engineering Show/West and conference are scheduled to take place at the Convention Center, Anaheim, California, December 5-7, 1978.

Sessions on incorporating microprocessors in new products, the use of plastics in design, and an emphasis on design questions particularly applicable to the aerospace, defense and electronic industries will highlight the conference.

For a guide to the show and a full conference program, contact Clapp & Poliak, Inc., 245 Park Ave., New York, NY 10017.



# COSMAC VIP

**\$249\*** gets the entire family into creating video games, graphics and control functions. For starters.



COSMAC VIP, the completely assembled, ready-to-operate RCA Video Interface Processor, opens up a whole new world of computer excitement. New challenges in graphics, games and control functions. Yet it's just \$249.00.

Easy to buy. And easy to program, thanks to its unique, easy-to-use interpretive language. You get a complete how-to book including programs for 20 games: fun, challenging, and ready to load and record on your cassette.

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Built around an RCA COSMAC microprocessor, the VIP is a complete computer system that can grow with you. It has 2K of RAM, expandable on-board to 4K. Plus a ROM monitor, audio tone output to a built-in speaker, power supply, and 8-bit input and output ports for control of relays, sensors, or other peripherals.

Soon RCA will offer options for color graphics and 256 tone sound generation. An optional auxiliary keyboard will open up an exciting world of two-player games.

### **Take the first step now.**

Check your local computer store or electronics distributor for the VIP. Or contact RCA VIP Marketing, New Holland Avenue, Lancaster, PA 17604. Phone (717) 291-5848.

\*Suggested retail price. Does not include video monitor or cassette recorder.

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"When I was shopping around for my system, the guys in the computer stores demonstrated all the unique features of the minifloppy. I've got to admit that at first I didn't really understand all the technical details. But now that I use the system every day, I really appreciate the minifloppy's fast random access and data transfer. I like the reliability, too.

"I'm glad I went with Shugart drives. Look, when you lay out your own money for a system, you want dependable performance and good value. Do what I did. Ask for the system with the minifloppy."

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See opposite page for list of manufacturers featuring Shugart's minifloppy in their systems.

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## AM-100 USERS GROUP

This user group is aimed at owners, users, and potential owners of the Alpha Microsystems AM-100 computer system. A newsletter is published monthly and mailed first class to members of the group. In addition, a library of user-submitted programs is available to members.

The newsletter principally concerns itself with software. Items which have recently appeared or will be included are: descriptions of programs submitted to the library, requests for programs, errors in system programs and their fixes (if any), user written and distributed applications software, a column for user feedback among the members, etc.

A list of user-owned hardware will be distributed to members so that potential hardware purchasers would have access to independent evaluations of the hardware rather than just the dealer's recommendations.

Membership costs are \$15 a year. For more information contact Leford F. Lowden, 616 Long Pond Rd., Rochester, NY 14612.

## STANDARD TEST PROCEDURE FOR ELECTRICAL CONNECTORS IS NOW AVAILABLE

RS-364-7, "Air Leakage Test Procedure for Electrical Connectors," has just been published by the Electronic Industries Association Engineering Department. This new publication was developed in response to the industry's need for hermetically sealed electrical connectors providing quick connect/disconnect capability while still maintaining the pressure/vacuum integrity of the container. This document contains several standardized methods for evaluating such connectors.

The procedure consists of establishing a pressure differential between the front and rear faces of a mounted connector receptacle and measuring the degree of leakage through the seals of the test sample by means of a detection device located on the low pressure side of the test sample. Leakage may be determined by hermetic seal or environmental seal test methods.

RS-364-7 is available at \$4.00 each from the Standards Sales Office, Electronic Industries Association, 2001 Eye St., N.W., Washington, D.C. 20006.

## TRS-80 MODS IMPROVE COMPUTER

Radio Shack TRS-80 computer users can have both Level I and Level II Basics in the same machine, can have lower case, can reduce the maze of cords, and can get some of the information about how to do these things free.

The second edition of the free Computer Information Exchange Newsletter tells how to shoehorn both Level I and II onto the same circuit board. It is available by sending SASE (with 15¢ postage) to CIE, Box 158, San Luis Rey, CA 92068.

The lower case articles, including what to do about the Radio Shack Level II blooper, are in CIE's magazine, TRS-80 Computing 1:1, subscriptions available for \$10 (12 issues).

Also in the 32-page first edition of the magazine are articles by TRS-80 designer Steven W. Leininger, by a Radio Shack repairman, and two programmers. Also, how to install your own 16K memory chips, and save. A complete set of schematics is reproduced on 10 pages.

For subscriptions or more information contact Computer Information Exchange at the above address.

## SELF-STUDY MICROCOMPUTER TRAINING SYSTEM

Integrated Computer Systems, Inc. introduces the beginner-oriented 8080A-based "Self-Study Microcomputer Software/Hardware Training Course." With built-in keyboard and display, no expensive teletype or CRT terminal is required.

Designed for use in the home or office, this course (No. 525) includes all system hardware, software and information best suited for learning to program and fully use an 8080-type microcomputer system.

The 650-page Workbook/Text teaches 8080 instructions 1-by-1, programming, debugging and hardware interfacing through 33 hands-on exercises.

For more information contact Integrated Computer Systems, Inc., Self-Study Training Dept., 3304 Pico Blvd., P.O. Box 5339, Santa Monica, CA 90405, (213) 450-2060.

## CALL FOR PAPERS

A call for papers and participants is out for the Fourth Conference on Gambling. It will be held at the MGM-Grand Hotel in Reno, Nevada, December 17-19 of this year.

This is a special announcement that is being put out in order to reach members of various computer clubs, users groups, and readers of the many computer magazines, and the research they have made.

Anyone wishing to present a paper should submit two copies as soon as possible to Professor William Eadington, Program Coordinator, Bureau of Business & Economics Research, University of Nevada, Reno, Reno, Nevada 89557. For more information call Professor Eadington at (702) 784-6850.

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4448 Piedmont Ave.  
Oakland, CA 94611

**Imsai Mfg. Corporation**  
14860 Wicks Blvd.  
San Leandro, CA 94577

**Industrial Micro Systems**  
633 West Katella, Suite L  
Orange, CA 92667

**North Star Computer**  
2547 9th Street  
Berkeley, CA 94710

**Percom Data**  
318 Barnes  
Garland, TX 75042

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460 Warg Dr.  
Santa Barbara, CA 93111

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20834 Lassen Street  
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**Thinker Toys**  
1201 10th Street  
Berkeley, CA 94710

**Vista Computer Company**  
2807 Oregon Court  
Torrence, CA 90503

 **Shugart Associates**  
INTERFACE AGE 21



## 1978 INTERNATIONAL TELEMETRY CONFERENCE

The International Foundation for Telemetering announces the 1978 International Telemetry Conference to be held November 14-16, 1978 at the Hyatt House Hotel, Los Angeles International Airport, California.

The theme of the Conference is "Expanding Frontiers of Telemetry and Telecommunications." General Chairman is Ray Andelin, Rockwell International Corporation. Program Chairman is Frank Gerandi, Aerospace Corporation. Dr. Neil Birch, from the Office of the Secretary of Defense, will be the guest speaker at the luncheon on November 15.

For details contact Shelby Bass, EMR Telemetry, P.O. Box 3041, Sarasota, FL 33578, (813) 371-0811.

## COMPUCOLOR-INTERCOLOR USERS GROUP MAKES PROGRAMS AVAILABLE

The Compucolor-Intercolor Users Group will start making programs available to members without the donation of a program.

Club members may now order programs from the club's library for as low as \$2 each, plus a disk and handling charge of \$20 for the first disk and \$15 for each subsequent disk ordered at the same time.

Those donating an acceptable program will receive 5 or 6 programs back at no charge.

The club library has grown to over 300 programs, some not even categorized yet. It includes Editors, Assemblers, numerous Star Trek's, Hell's Dungeon, Piranha, all types of Star Wars type games, Deflector, printer routines, Life, Turtle, Eliza, Payroll's, Inventory, Kalaidoscope's and display programs.

Those wishing to join may send their \$10 or \$25 to Compucolor-Intercolor Users Group, 5250 Van Nuys Blvd., Van Nuys, CA 91401.

## INTERFACE WEST '78 EXHIBIT HALL LARGER THAN LAST YEAR

90 companies that market a product or service in one or more of the three separate subject areas covered at Interface West — small business systems, data communications and microcomputers — will be represented on a combined floor when the second annual West Coast show takes place November 14-16, 1978, at the Los Angeles Convention Center. About 20 other companies are in the booth selection process.

Sheldon G. Adelson, conference director, said the 1978 exhibit hall will be 50% larger than last year's show, which had 80 exhibitors occupying 150 booths.

For more information contact Interface West, 160 Speen St., Framingham, MA 01701, (800) 225-4620, in Massachusetts (617) 879-4502.

## NEW DESIGN & MANUFACTURING SERVICE BUREAU OPENS

Ocone Associates IDM, Inc. has formed a new bureau specializing in computer aided design and computer aided manufacturing (CAD/CAM) services.

With the capability to operate from data in almost any form, the bureau can provide total customer service or act as a support unit for companies whose requirements exceed their in-house installations.

For more information contact Ocone Associates IDM, Inc., 2805 W. 7th St., Fort Worth, Texas.

## USERS GROUP UNDERTAKES BENCHMARK ANALYSIS OF SMALL COMPUTER SYSTEMS

Rejecting the "seat-of-the-pants" approach to selecting a computer, the Association of Small Computer Users has commissioned the first industry-wide benchmark analysis of small computer systems.

The massive study will be conducted by Real Decisions Corporation of Stamford, Connecticut as a major step toward providing computer users with information not available from any other source.

The benchmark analysis will be performed on the most popular small systems to start, as determined by member requests, including the IBM 5110 and machines made by DEC, Wang, Hewlett-Packard, Data General and Datapoint.

Criteria for performance will be grouped under three broad categories: speed of repeated specific computing tasks, running time to perform actual user programs, and ease-of-use of the system's editing software.

The Association of Small Computer Users is located at 75 Manhattan Dr., Boulder, CO 80303.

## NEWSLETTER ON COMPUTERS AND MENTAL HEALTH

*Micro-Psych*, a newsletter for professionals interested in the use of computers in mental health, has recently been established.

Each bimonthly edition contains reviews of current work in the field, a forum for the exchange of information, an on-going bibliography, book reviews, and news about pertinent hardware and software.

Membership and a subscription to *Micro-Psych* costs \$10 a year. For more information contact Marc D. Schwartz, M.D., 26 Trumbull St., New Haven, CT 06511.

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You'll find a product line that's continually evaluated to provide you with the widest and best selection in quality, brand name microcomputers anywhere. You'll find an enthusiastic and knowledgeable staff able to interpret all the equipment specifications, in terms of how they apply to you, and in a way you'll understand. You'll find demonstration areas where you can get a firsthand experience of running a computer yourself.

## COMPUTERS FOR BUSINESS



You'll find educational materials to give you a total insight into the world of microcomputers.

You'll find a fully equipped service department to provide whatever assistance is required to keep your computer running in top-notch condition. You'll find computer user's clubs to join, where you can share ideas with people as enthusiastic as yourself. And, with each new visit, you'll find excitement—from the people you deal with, the equipment they offer, and from your own ever-growing personal involvement.



Enough about us. How about what computers do. To attempt to describe all the things your computer might do, would be to describe your imagination. So instead, we'll briefly list some of the many things for which small computers are already being used.

**In business**, the advent of the versatile and compact microcomputer has put the benefits of computing within reach of small companies. With systems starting at less than \$6000, the businessman can

computerize things like accounting, inventory control, record keeping, word processing and more. The net result is the reduction of administrative overhead and the improvement of efficiency which allows the business to be managed more effectively.

**In the home**, a computer can be used for personal budgeting, tracking the stock market, evaluating investment opportunities, controlling heating to conserve energy, running security alarm systems, automating the garden's watering, storing recipes, designing challenging games, tutoring the children . . . and the list goes on.

**In industry**, the basic applications are in engineering development, process control, and scientific and analytical work. Users of microcomputers in industry have found them to be reliable, cost-effective tools which provide computing capability to many who would otherwise have to wait for time on a big computer, or work with no computer at all.

## COMPUTERS FOR THE HOME



## COMPUTERS FOR INDUSTRY



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NOVEMBER 1978

CIRCLE INQUIRY NO. 16

INTERFACE AGE 23



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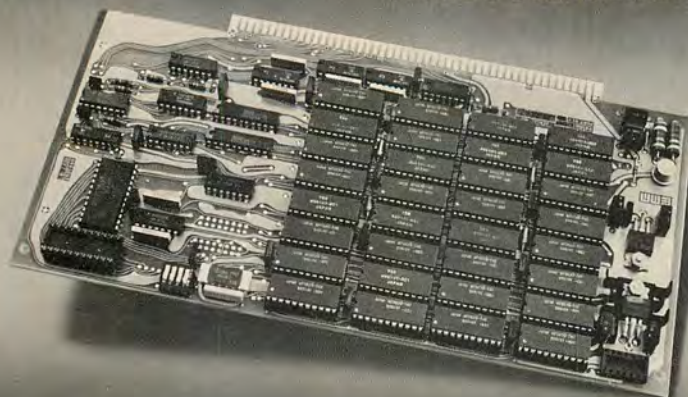
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## MILITARY ELECTRONICS EXPO '78

Red carpet treatment will greet visitors to the inaugural Military Electronics Expo, to be held November 14-16 at the Anaheim Convention Center, Anaheim, California.

The conference and exhibition are planned to provide a forum for bringing together the defense electronics prime contractors and the aerospace industry with the products of military electronics components, subsystems, and instrumentation.

In attendance will be more than 5,000 design engineers, research, and development personnel, program managers and procurement officials of prominent industrial firms, as well as representatives of Departments of the United States Government concerned with our nation's defense. A substantial contingent of distinguished observers from overseas nations is also expected.

A top attraction of the Technical Program supporting the exhibition is a series of high-level tutorial courses designed to update attendees' knowledge in such areas as Military/Aerospace Microprocessor Systems, Synthetic Aperture Radar and Fiber Optic Communications Systems.

The large exhibition will range from basic components through sophisticated sub-assemblies, systems and instrumentation as they relate exclusively to military and defense electronics. Many of the nation's most distinguished suppliers are among the exhibitors.

Admission to the exhibition is free to all individuals actively engaged in the industry. For further details contact Industrial & Scientific Conference Management, Inc., 222 W. Adams St., Chicago, IL 60606, (312) 263-4866.

## SECOND ANNUAL PACS COMPUTER GAMES FESTIVAL

The Second Annual PACS Computer Games Festival will be held November 18, from 10 A.M. to 6 P.M. at LaSalle College in Philadelphia.

Sponsored by the Philadelphia Area Computer Society, the Festival will feature games and many other applications of personal computers.

At the last festival over 1200 people came to see the amateurs' and exhibitors' computer-based games. Again, the latest in commercial computer games will be displayed, as well as an amateur section competing for prizes.

For more information contact our Festival Chairman: Dr. Stephen Longo, LaSalle College Physics Department, Box 312, Philadelphia, PA 19141, or write to PACS, Box 1954, Philadelphia, PA 19105.



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# CALENDAR

**Dec 1 Crescent City Computer Club** will hold its meeting at the University of New Orleans, Lakefront Campus at 8 P.M. Call Bob Latham at (504) 722-6321 for more details.

**Dec 1 Microcomputer Information Group** will meet at 7 P.M. at the Microcomputer Resource Center, 5150 Anton Dr., Rm. 212, Madison, WI 53719, (608) 274-8925. Len Lindsay, president.

**Dec 2 Louisville Area Computer Club (LACE)** will meet at the University of Louisville, Speed School Auditorium at 1 P.M. For details, write the club at 115 Edgemont Dr., New Alban, IN 47150.

**Dec 2 Milwaukee Area Computer Club** will meet at 1 P.M. at the Waukesha County Technical Institute, New Berlin, WI. Call (414) 246-6634 for further details.

**Dec 2 Oklahoma Computer Club** will be meeting at the Belle Aisle Library at 10 A.M. Call Al Campbell at (405) 842-4933 for details.

**Dec 2 South Central Kansas Amateur Computer Association**, 9:00 A.M., Wichita Public Library, Wichita, KS. For further information call Chris Borger at (316) 265-1120 or Dave Rawson, 1825 Gary, Wichita, KS 67219, (316) 744-1629 for further details.

**Dec 2 Southern Nevada Personal Computing Society** will meet at Clark County Community College, Las Vegas, NV at 12:00. The club also meets on the 3rd Saturday of the month. For further information write SNPCS, 1405 Lucille St., Las Vegas, NV 89101 or call (702) 642-0212.

**Dec 3 The Computer Hobbyist Group** will meet at 1 P.M. in the Green Center, Rm 2.530, of Univ. of Texas, Dallas. For details write to P.O. Box 11344, Grand Prairie, TX 75051.

**Dec 4 Amateur Radio Research and Development Corp. (AMRAD)** meets the first Monday of each month at 8 P.M. at the Patrick Henry Branch Library, 101 Maple Ave. E, Vienna, VA. for details write the club at 1524 Springvale Ave., McLean, VA 22101.

**Dec 4 Minnesota Computer Society** will meet at the Brown Institute, Room 51, 3123 E. Lake Street, Minneapolis, MN. For further information contact the Society at Box 35317, Minneapolis, MN 55435, Attn: Jean Rice.

**Dec 5 Tidewater Computer Club** meets at the Electronic Computer Programming Institute, Janaf Office Bldg., Janaf Shopping Center in Norfolk. The club also meets on the 3rd Tuesday of the month. For details contact: C. Dawson Yeomans, Interface Chairman, 677 Lord Dunmore Dr., Virginia Beach, VA 23462.

**Dec 6 Columbus Computer Club** will meet at the Center of Science and Industry at 7:30 P.M. For details contact Fred Hatfield K8VDU, Computer Data Systems, 1372 Grandview Ave., Columbus, OH 43212, (614) 488-3347.

**Dec 6 Kitchener Waterloo Micro-computer Club** meets at 7:30 PM, at the University of Waterloo, Rm 3388, Engineering Bldg. #4, University Ave., Waterloo, Ontario, Canada.

**Dec 6 Lincoln Micro-Computer Club** will hold its meeting at the 611 No. 27th St. at 7 P.M. For more details write Hubert Paulson, Jr., 422 Dale Dr., Lincoln, NE 68510.

**Dec 6 New England Computer Society** will meet in the cafeteria of the MITRE Corp. at 7:00 P.M. Located on Route 62 in Bedford, MA. Contact Dave Day at P.O. Box 198, Bedford, MA 01730, (603) 434-4239 for details.



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CIRCLE INQUIRY NO. 60

Dec 6 Sacramento TRS-80 User's Group meets on the 1st Wednesday of each month from 7-10 PM. For location and other information call Sal Alestra at (916) 927-0237 or write 437 Berthoud St., Sacramento, CA 95838.

Dec 6 The Valley Computer Club will meet at 7 P.M. at the Harvard School located at 3700 Coldwater Canyon, Studio City, CA.

Dec 6 Great Gulf Coast Computer Club G<sup>2</sup>C<sup>3</sup> in Mobile, Alabama, meets the first Wednesday of every odd month. For time and location of the meeting call (205) 478-1777.

Dec 7 Bay Area Microprocessors Users Group (BAMUG) will meet in the Hayward ROC Center, 26316 Hesperian Blvd., Hayward, CA at 7:30 P.M. For further details write BAMUG, 1211 Santa Clara Avenue, Alameda, CA 94501.

Dec 7 Microcomputer Users Group (MCG) will hold its meeting at the University of Minnesota, Electrical Eng. Rm. 115 at 7 P.M. The club meets every Thursday. For more information write MCG, Dept. of Elec. Eng., 123 Church St. S.E., Minneapolis, MN 55455.

Dec 7 Northwest Computer Society meets in the Pacific Science Center in Seattle, Room 200 at 7:30 P.M. The club also meets on the third Thursday of the month. For more details write NCCN, Box 4193, Seattle, WA 98055.

Dec 8 HAUCC will meet at 7:30 PM in Rm 117 of the Science & Research Bldg. of the main campus of the Univ. of Houston. For more details write or call P.O. Box 37201, Houston, TX 77036, (713) 661-6806.

Dec 8 Northern New Jersey Amateur Computer Club (NNJACC) will hold its meeting at the Fairleigh Dickenson University, on the Rutherford Campus, Becton Hall, Room B8, at 7 P.M. For details write NNJACC, 593 New York Ave., Lyndhurst, NJ 07071.

Dec 9 The Permian Basin Computer Group — Odessa Chapter meets at 1 P.M. in the Electronic Technology Bldg., Room 203 on the Odessa College campus. For details contact John Rabenaldt, Box 3912, Odessa, TX 79760, (915) 332-9151.

Dec 10 North Orange County Computer Club will have its meeting at Chapman College, Orange, CA. Doors open at 12:00. 105 Hashinger Hall Auditorium. Membership Chairman, Tracey Lerocker, (714) 998-8080 evenings. For more information write P.O. Box 3603, Orange, CA 92655.

Dec 12 Okaloosa Computer Hobbyist Club will meet in the Community Room of the First Federal Savings & Loan Assoc. of Okaloosa County, 158 Elgin Pkwy N.E., Ft. Walton Beach, FL at 7 P.M. For details call (904) 242-5938.

Dec 12 Rome Area Computer Enthusiasts (RACE) meets on the second Tuesday of every month at Patty's Stagecoach Inn at 7:30 P.M. For details contact Mike Troutman, RD 1, W. Carter Rd., Rome, NY 13440, (315) 336-0986.

Dec 13 Home Computers Users Group for Radio Shack TRS-80 meets at 7:30 PM. For details write or call TRS-80 Users Group Information of Eastern Massachusetts, c/o Miller, 61 Lake Shore Road, Natick, MA 01760, (617) 653-6136.

Dec 13 Homebrew Computer Club meeting will begin at 7 P.M. in Menlo Park, CA at the Stanford Linear Accelerator Center Auditorium. Contact the club at P.O. Box 626, Mountain View, CA 94042, (415) 967-6754 for details.

Dec 13 Blackhawk Bit Burners Computer Club meets on the second Wednesday monthly at 7:15 PM in Rockford, IL. For more information contact Frank D. Dougherty, 325 Beacon Dr., Belvidere, IL 61008, (815) 544-5206.





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CIRCLE INQUIRY NO. 25

Dec 14 Mid America Computer Hobbyist meeting will be at 7:00 P.M. at Commercial Federal Savings & Loan, Bellevue NE. Intersection of Galvin Rd. and U.S. Hwy. 73-75. Write P.O. Box 13303, Omaha, NE 68113 for further information.

Dec 14 North Florida Computer Society will meet at 227 Edison Dr., Pensacola, FL 32505. For details write this address or call Eugene Rhodes at (904) 453-3844.

Dec 14 The Rochester Area Microcomputer Society will meet at the RIT Campus, Rm. 1030, Bldg. 9 at 7:30 P.M. For details write RAMS, P.O. Box D, Rochester, NY 14609.

Dec 14 Utah Computer Association will meet at Murray High School, Rm 154, 5440 S. State St., Salt Lake City, UT at 7 P.M. For details write or call Larry or Holly Barney, 1928 S. 2600 E., Salt Lake City, UT 84108. (801) 485-3476.

Dec 15 Amateur Computer Group of New Jersey (ACGNJ) meets at UCTI, 1776 Raritan Rd., Scotch Plains, NJ 07076 at 7 P.M. For further information write to the club at the above address.

Dec 15 Long Island Computer Association meets at 7 PM at the New York Institute of Technology, Old Westbury Campus, Route 25A between Route 107 and Glen Cove Rd., Rm. 508. For more details write Long Island Computer Association, 36 Irene Lane East, Plainview, NY 11803.

Dec 16 Computer Hobbyist Group of North Texas meets at UTA University Hall, Rm 108 at 1 PM in Arlington, TX. For details contact Neil Ferguson at P.O. Box 1344, Grand Prairie, TX 75051, (817) 387-0612.

Dec 16 Philadelphia Area Computer Society will meet at 2 PM at LaSalle College Science Bldg. at the corner of 20th & Olney Ave. For more details write PACS, P.O. Box 1954, Philadelphia, PA 19105.

Dec 16 The 7C's Committee (Affiliated with the Cleveland Digital Group) will meet at Cleveland State University Student Services Bldg., in the Kiva Room at 2:00 P.M. For more information write to Cleveland Digital Group, 8700 Harvard Ave., Cleveland, OH 44105.

Dec 16 San Diego Computer Society will meet at the Grossmont Community College Student Center, 8800 Grossmont College Dr., El Cajon, CA. Doors open at 12:30. For details write P.O. Box 9988, San Diego, CA 92109, or call (714) 565-1738.

Dec 17 Central Florida Computer Club will meet at 2010 Fosgate Dr., Winter Park, FL 32789 2:00 PM. Contact Bill Kerns for details.

Dec 17 Cleveland Digital Group meets at 2 P.M. in the old railroad station at Safier's Inc., 8700 Harvard Ave., Cleveland, OH 44105. Write the club at this address for more information.

Dec 19 Rhode Island Computer Hobbyists (RICH) meets the at the Knight Campus of Rhode Island Junior College in the Faculty Cafeteria at 7:30 P.M. For details contact Emilio Iannucillo, RICH, P.O. Box 559, Bristol, RI 02809, or call (401) 253-5450.

Dec 21 Madison Computer Society will meet at 7:30 P.M. at 2707 McDivitt Rd., Madison, WI 53713. Mike Shoh, president.

Dec 21 Sacramento Pet Workshop meets from 7-10 P.M. every third Thursday of the month. For more information contact David Howe, (916) 445-7926.

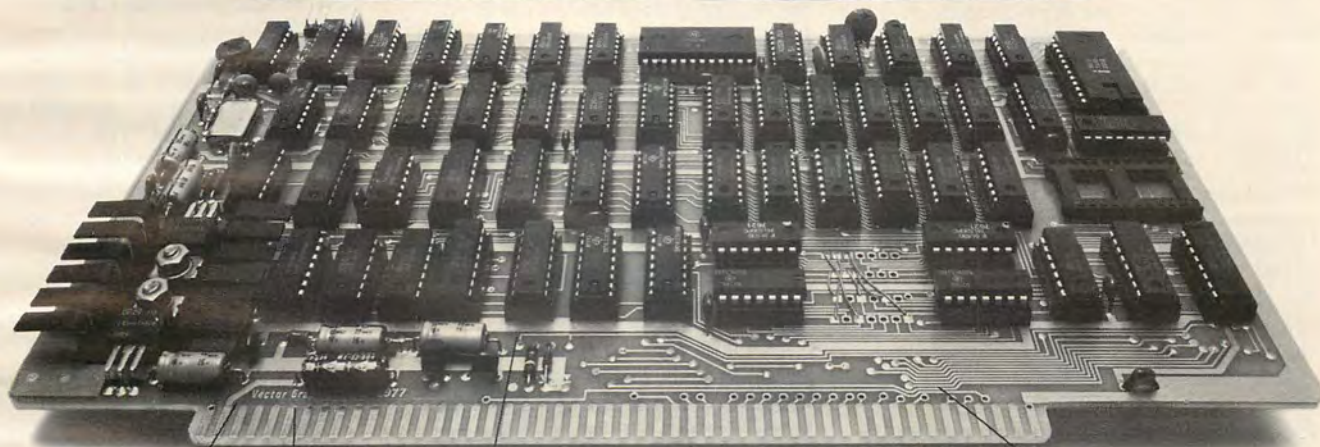
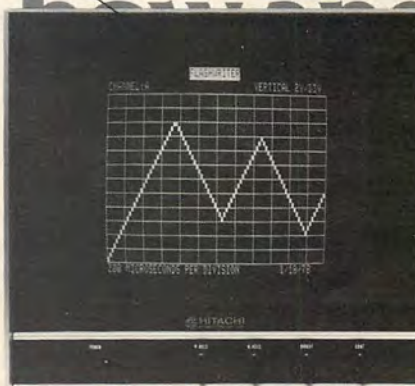
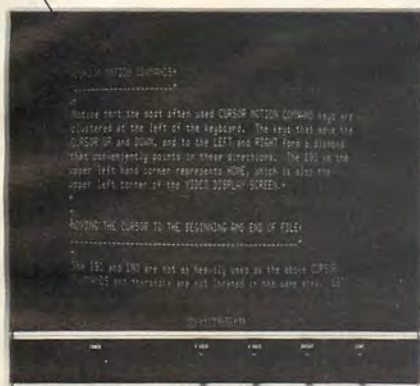
Dec 22 Alamo Computer Enthusiast meets at 7:30 PM in Rm 104 at Chapman Graduate Center at Trinity University, San Antonio, TX. For details call (512) 532-2340, or write to the club at 7517 Jonquill, San Antonio, TX 78233.



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Dec 22 Washington Amateur Computer Society will meet at the Catholic University of America, St. Johns Hall, located at Michigan and Harewood Aves. in Washington, D.C. Contact Bill Stewart at (202) 722-0210 for club details between the hours of 10 A.M. and 12 P.M.

Dec 24 Birmingham Microprocessor Group will meet at Southcentral Bell Company headquarters bldg. at 2 P.M. For further details write or call Jim Anderson, 2931 Balmoral Rd., Birmingham, AL 35223; (205) 897-9630.

Dec 24 Summit City Computer Club will meet at the McMillen Library on the Indiana Institute of Technology Campus in Ft. Wayne, IN. For details write the club at P.O. Box 5096, Ft. Wayne, IN 46805.

Dec 26 Computer Amateurs of So. Jersey will hold its meeting at the National Park Municipal Bldg., 7 So. Grove Ave., National Park, NJ at 7:30 P.M. For details call (609) 541-1010, or (609) 541-8296.

Dec 26 Sacramento Microcomputer Users Group, (SMUG), 7:30-9:30 P.M. at SMUD Training Bldg., on 59 St. Write Richard Lerseth, P.O. Box 161513 or call (916) 381-0335 after 5:00 P.M.

Dec 26 Okaloosa Computer Hobbyist Club will meet in the Santa Rosa Rm, in the Santa Rosa Mall, Mary Esther, FL at 7 P.M. For details call (904) 242-5938.

Dec 26 The Digital Group Group meets the last Tuesday of each month in the meeting room of Consumer Systems at 2107 Swift Rd., Oak Brook, IL at 7:30 PM. For more information write the group c/o William L. Colsher, 4328 Nutmeg Ln., Apt. 111, Lisle, IL 60532.

Dec 26 The Apple Portland Program Library Exchange (APPLE) meets on the last Tuesday of each month at 7:30 PM. For location

and details contact Ken Hoggatt, 9195 SW Elrose Ct., Tigard, OR 97223, (503) 639-5505 or (503) 644-0161, Ext. 6136.

Dec 26 Southern California Users of RT-11 (SCURT) will meet at 9:30 AM at USC's Annenberg School of Communications. For details call Mark Bartelt, (213) 795-6811, ext. 2663; or Ray Rittenhouse, (213) 640-1830, ext. 225.

Dec 27 Ventura County Computer Society will meet at Camarillo Public Library, 3100 Ponderosa Dr., Port Hueneme, CA 93041 at 7:30 P.M. For more information write: VCCS, P.O. Box 525, Port Hueneme, CA 93041.

Dec 27 Diablo Professional Users Group (DPUG) will meet at Diablo Valley College Library, near the Willow Pass exit of Fwy. 680, from 8-10 PM. For details write or call Bob Hendrickson, Electronics Dept., DVC, Pleasant Hill, CA 94523; (415) 687-8373.

Dec 27 Boston Computer Society will meet at the Commonwealth School, 151 Commonwealth Ave., Boston at 7 P.M. The school is located on the corner of Dartmouth St. in Boston's Back Bay. For information write or call the society at 17 Chestnut St., Boston, MA 02108, (617) 227-1399.

Dec 27 The National Capitol Chapter of the Tandy Computer Users Group meets on the last Wednesday of each month. For details contact Rod Wright, 8205 Chivalry Rd., Annandale, VA 22003, (703) 560-5854.

Dec 28 Space Coast Microcomputer Club will meet at 7:30 PM at the Merritt Island Library, Merritt Is., FL. Contact Glynn Mills at R3, Box 904, Merritt Is., FL 32952.

Dec 28 Small Computer Engineering Association of Minnesota (SCEAM) will meet at the Resource Access Center, 3010 Fourth Ave. So., Minneapolis, MN 55408 at 7 P.M. For more information write to this address or call (612) 824-6406.



# WHITE COLLAR MICROCOMPUTER

By Jack Emmerichs  
Milwaukee, Wisconsin

The small business establishment looking for micro-computer sized business systems today does not face either a buyer's or a seller's market. Rather, one finds a developing market where the status of both buyer and seller seem to change constantly.

A buyer's market exists when the sellers know the potential buyer's needs and provide such a wealth of products to choose from that competition between vendors keeps the prices down and the choices up. A seller's market exists when the buyers know what they want and only one vendor can provide them with it.

The current microcomputer business system market can best be characterized by a group of potential users who are just beginning to realize that they can be buyers but often don't know what they can or should get. It is also characterized by a group of potential vendors who are trying to provide usable systems as soon as possible with as little investment as possible and which are to run on a rapidly changing selection of equipment that is becoming less and less standardized. This month's column is therefore directed towards giving the buyers in this market some guidelines to look for when venturing into the open marketplace.

The most important thing to do when looking for a business system is to make sure you know what it is you need. The following major functions are usually considered when evaluating business system needs.

The General Ledger function keeps track of a company's books. This function usually produces financial statements, profit and loss statements, and some sort of transaction journal for each account. It may also keep track of outstanding checks or perform other financial duties. The General Ledger is usually the central function of a business system and is a good place to start if you only need a little help. Just about anyone who keeps books can make use of it.

The Inventory Control function keeps track of an inventory of goods. This function usually maintains a file containing current stock status and produces reports on stock reordering, item profitability, stock value, and cost of replacement. It may also provide a point of sale capability so that stock status is adjusted as sales or deliveries are made throughout the day.

The Personnel or Payroll function keeps track of employees' amount paid and hours worked records. It usually can calculate and print paychecks and provide 941, 940 and other federal, state, and perhaps local government reports. It may also provide cost of labor or other employee history or analysis reports.

The Accounts Receivable function keeps track of receivable items, usually by invoice and customer. It provides billing reports, a customer history, projected income reports, past due reports and any other information needed to control the payment of your invoices. It may also provide customer profitability reports and other functions which provide information on where your best or worst business is being done.

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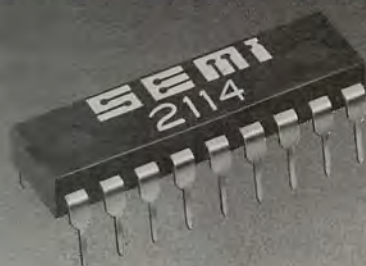
Administrative Systems, Incorporated (A.S.I.), producer of the MEDICAL/DENTAL ACCOUNTS RECEIVABLE/BILLING software package for 8080/Z80 based microcomputers, is looking for distributors in some areas. A fixed license fee allows you to modify and distribute this software to end-users as many times as you wish. If you have experience with microcomputers, or have been working with the medical/dental market, you may be qualified to distribute this sophisticated software package. For complete details, contact us... while there's still time.

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The Accounts Payable function keeps track of payable items, usually by invoice and by vendor. It ages invoices until payment is due, controls the writing of checks and provides reports on future cash requirements, vendor history and overdue bills.

In addition to these major functions there are other areas of business management that a small business system can help with but is less often called upon to do so. These include such items as Budgeting, Forecasting, and Fixed Asset Controls, and a host of functions related to specific businesses such as manufacturing, health care, timekeeping, and so on.

**The current microcomputer business system market. . . is characterized by potential users who don't know what they can or should get . . . also by potential vendors who are trying to provide usable systems . . . to run on equipment that is less standardized.**

In addition to the different functions that are available, there are different levels of complexity which each function may support. At the simple end of things are the requirements of a single establishment at a single location such as a small retail store. Things can be more complicated for an establishment with multiple divisions where reports are desired for each division as well as for the entire establishment. Finally, things can get truly intricate when the business requires job accounting or cost accounting so that all costs for personnel, materials, and overhead can be accounted for by specific jobs or projects as well as all the normal accounting requirements.

While perusing this impressive array of management assistance, you should be aware of several things that you probably do not want. The following considerations should be kept in mind when defining your needs.

You do not need a system that creates more work than you have to do now, especially if it does not provide significant improvements in your ability to manage your business. You should not expect to eliminate all of your work, but look out for systems that require large amounts of information regularly that you will not make use of. For instance, if you need a cash disbursements journal along with the General Ledger function, can it be provided with the General Ledger itself, or must you also maintain a complete Accounts Payable function to provide this one report?

You do not need a system that is hard to use and is more frustrating to handle than doing the work manually. The system should check for user errors whenever possible and allow for easy corrections. As you use the system, it should be easy to understand and, in the language of system designers, it should be friendly.

You do not need a system the initial cost of which is more than you can reasonably justify. This has traditionally been the major reason that small business has had no access to computerized business systems. As the performance of microcomputers continues to develop, however, the cost of such systems will become acceptable to more and more users. Costs can be justified on the basis of increased accuracy, decreased processing time, and increased independence from outside con-



sultants such as accountants or computer utilities. Just make sure you don't get in over your head.

Finally and most important, you do not need a system that requires you to change the way you do business. Computerized business systems are tools which can help you more effectively manage your business. The tool should be chosen to fit the job. The job should not have to be distorted to fit the tool.

Now that we have considered the type of help that we need and have a firm grip on the types of problems that we want to avoid, it is time to go shopping. Let's assume for the sake of an example that we would like to start off with the General Ledger, Payroll, and Accounts Receivable. For this example we are selling a service rather than merchandise so there is no need yet for Accounts Payable or Inventory Control. What little we have to do for these functions we will continue to do by hand.

There are several places to look for the systems we need. Most of the microcomputer magazines carry advertisements for such items. Such advertisements can help one decide which systems should be evaluated in detail.

Frequently, however, the best place to go to actually purchase a system is to a local computer store. Such a store usually exists by serving the local business community. Therefore, continuing service will usually be much better here than from a mail order deal. Besides, the store can usually get you any item advertised in the better magazines. More important is the fact that you can often compare systems and get the opinion of the people that have to support the items that they sell. To coin a bumper sticker, "Support Your Local Computer Store."

In the process of evaluating a specific business system, there are several points that you should cover. The following items are some of the most important things to bring up when considering a business system.

Does it do what you want it to do? In our example the three functions that we have identified as our requirements should be available. Furthermore, we should not be required to purchase more than we need.

Can it be expanded in the future? It is quite possible that we will tire of processing part of our business on a computer and part of it by hand. Can the remaining functions be added later at a reasonable cost? Will our current system have to undergo any major changes when other functions are added?

Can we see a demonstration of the system now? Do not buy something that does not yet exist. There are a lot of systems that "almost" work. Beware of them! An exception to this is a function under development that you do not need now anyway. If the inventory function will not be needed until next year and it is scheduled to be completed at the end of this year, that may be acceptable. Know who you are dealing with under such conditions because such completion schedules often slip a bit and in some cases have been dropped altogether. A reputable vendor's system should not be ignored, however, simply because it is not all finished yet. In fact, a well maintained system is never completely done because the people working on it are constantly improving and expanding it.

Can we talk to someone who is currently using the system? A few words from a satisfied customer are far more meaningful than all the promises of a dealer. This is in no way degrading to the dealer because if it is the type of establishment that you want to do business with, they will have no trouble identifying satisfied customers for you.

What type of equipment does it run on? Beware of systems that only run on some obscure type of equipment. While there is no universal standard of equipment in the microprocessor world, there are a few items that

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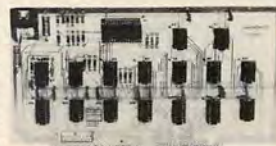
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have broad enough support to insure their continued existence. Furthermore, the broader the support for your equipment, the more likely you will be to find additional programs that will run on it.

What other programs or systems are available for the equipment involved? There may be items that you have not thought about yet that are worth considering. Word processing is a good example and may have some influence on the type of printer that you will want to have. It is a good idea to look at the equipment and systems available with an eye to the future.

Who wrote the system? Be very wary of systems that have been turned out by a hobbyist-turned-system-designer. Even with the best of intentions, the first efforts of such people are things to avoid. Problems also arise from business specialists who are just learning computer techniques or from computer experts who are just learning business requirements. The best bet is to find a system that has been designed by a computer professional who is familiar with business needs. While such people are still fairly rare in the microcomputer world, there are some and their number is increasing.

How will the system be supported? Find out if custom changes can be made to the system. If an error is found in the way the system works, who will fix it, how soon and will it be fixed for free? Check into the service support for the equipment. These are areas where the local store will be able to offer you more assistance than anyone at a distant location.

Is the system well documented? Are there step by step instructions on how to use the system and how to handle errors that are sure to be detected. If the system is not set up for you, is there adequate documentation on how you are to do it? Will there be a training cost for the operator? How much support in getting the system running will you get?

Before you decide to purchase a computerized business system you should be satisfied about the answers to all of the above questions and any other questions that you find significant. As you look at the number of considerations that we have talked about, you may feel that there is not likely to be anyone who can provide all of this for you. Be persistent. You have the right to have the system you need. In the next few years several current projects will appear on the market and the selection will improve.

Today there are some systems available that adhere to the standards that we have been discussing. Osborne and Associates of Berkeley, California has a fairly complex Payroll system that will handle cost accounting, although it is not very generalized. Alpha Microsystems of Irvine, California has a very complete business system for their equipment that has been based on a proven system from the microcomputer field. It requires rather a large investment in equipment, however, and needs a resident programmer to set it up. Advanced Technology Associates of Milwaukee, Wisconsin has a General Ledger system and a Personnel/Payroll system that have been modeled on large corporate systems but are designed specifically for the small to medium size business. The problem here is that the rest of the functions are still in development.

No single system will prove useful for all possible users and no user will be able to use any and all of the available systems. It is the buyer's responsibility to set his or her sights on the proper system and then look for it. It is the seller's responsibility (along with those developing the systems) to provide a selection of adaptable, well documented, easy to use systems. If you are a buyer, you should know the rules of the game before you enter the marketplace. If you do, you will find the hunt for the proper system to be a rewarding one. □



# THE MIND REVOLUTION

By Merl Miller

Few things in the world of computers inspire as much thought and controversy as artificial intelligence. For those of you who have written to me in the past few months, thank you. I hope to respond to everyone's comments and queries either in this column or in person, somehow. If your comments are thought provoking I will, at least, mention your name. But, please write. I'd like to see this column become an open forum on artificial intelligence.

Meanwhile, I think the three most thought provoking letters I've received to date came from David Morris, Ron Magazzu and Nathaniel Cunnigwell. Mr. Morris' interest is mechanical and computer linkage. He has proposed a simple model of a robot-controlled car.

Mr. Magazzu is a working psychologist interested in behavioral aspects of both human beings and artificial beings.

Mr. Cunnigwell's primary interest is learning. If you would like to correspond with any of these men, please write in care of my office. I will certainly forward your letters.

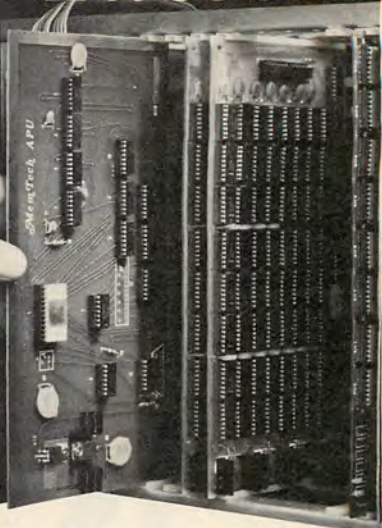
About the only AI researchers I haven't stirred up are the pattern recognition people; so I will try to do that this month. It opens wide to a lot of controversy. After all, it isn't very hard to use a scanning device to show a computer a picture and get it to guess what the picture is. The difficult part is getting the computer to be accurate.



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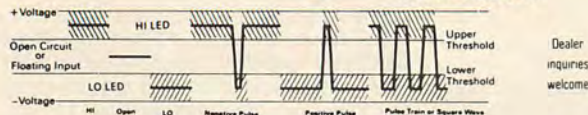
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The problems with pattern recognition start to occur when you ask the computer to recognize versions of the same thing. There is no way to put *all* possible types of patterns into the computer's memory. Somehow, you must teach it to make decisions. If you remember our dissertation on the Hopkin's Beast (September) you'll have some understanding of the pattern recognition problem. The Beast could recognize a wall plug if it were optimally placed and fit a specific set of criteria. If there was any change in this criteria the plug was ignored. For pattern recognition to work in a variety of situations, the machine must be able to relate a sample to some class of patterns with similar, but not necessarily identical, characteristics.

**"This is *not* a sheep, *not* a horse and *not* a chicken. Therefore, it must be a turkey." When, in fact it might be an elephant. Who knows?!! It has big grey ears and says "Gobble, gobble, gobble."**

This leads us to the concept of "best fit". Given the premise that no two things are exactly alike, groups of stored rating profiles can be stored in the machine. Recognition items can then be compared to the stored information on a "best fit" basis. For instance, let's assume we teach the computer to recognize a circle, rectangle and a triangle. Circles are easy because, regardless of size, the shape is exactly the same. A rectangle is a little more difficult because it can have varying side lengths. Triangles, of course, are the hardest due to great differences in shape (angle and side measures). Once we've taught the computer this little trick it can easily sort any patterns it's shown into circles, rectangles or triangles.

Let's take this concept a step further and talk about a very practical application of pattern recognition — mail sorting. The postal service processes millions of pieces of mail each day. In many locations an optical scanner is used to read the zip code on each piece and sort the mail accordingly. Typewritten images, for the most part, are easily recognized and go right through the system. The system begins to bog down when it tries to read handwritten images. For instance, this number **27274** is "27274". There is a high probability that it would be rejected and put into the hand sort basket.

You can *teach* the computer to recognize numbers by *showing* it numbers. Hold a "2" up to the scanner and tell the computer, "This is a 'two'; remember it." Furthermore, you could tell it, "If '2' appears in the first and second places of a zip code, send the letter to the state of Virginia." Now, what happens if someone writes a "2" that looks like a "7"? The computer sends the letter to Texas. Oh, well.

The problem is the computer is working with "best fit" because too much memory is required to store all the possible "exact fits". Hence, the reason for pattern recognition, rather than pattern duplication.



Now that you have at least a vague idea of what pattern recognition is, we can turn our attention to how it works. Basically, there are three phases the computer goes through to recognize a pattern: data acquisition, pattern analysis and pattern classification.

Data acquisition is the process of converting the picture into a digital representation. This can be done by a variety of means but, for our purposes, let's assume it is done by an optical scanner. It can, of course, be done by any device that can convert a signal from an audio or video form into a digital form.

Next, the data has to be analyzed. The general idea behind this process is for the machine to learn all it can about the data. It must determine the different events or pattern classes that might exist in the data and, once done, organize the data into some efficient manner. It must do such things as feature selection, extraction and cluster analysis.

The machine is ready to classify what it has learned. In this phase of operation it will put data samples into a known class. This is the most difficult part of the process; much of what the machine does is dependent on how well designed the recognition logic is.

One of the major problems with the classification process is that it works with what is *not*, rather than what *is*. The program simply eliminates things until there is only one thing left and then...ah ha! This is much like saying, "This is *not* a sheep, *not* a horse and *not* a chicken. Therefore, it must be a turkey." When, in fact, it might be an elephant. (Who knows?! It has big grey ears and says, "Gobble, gobble, gobble." Some people may still classify it as a turkey; hopefully, most machines won't.)

In order for any pattern recognition program to work there must be a lot of interaction between the various processes. This can best be effected by looking at the three elements that most influence the pattern recognition problem: the amount of data, computer technology and the human being.

The human element is, by far, the most crucial. Pattern recognition has to relate to the user or it is meaningless. Therefore, any methodology developed for data acquisition, data analysis and pattern classification must suit human requirements. This means there must be an acceptable human to machine interface. At each stage of the problem, acquired data and computational results must be matched to the people involved.

The machine must also be capable of handling massive amounts of data. It has been estimated that a computer would need a storage capacity of 90 million bits just to run a handwriting analysis program. What this means is that even with the recent advances in LSI technology, much of the collected data for any given problem can never be analyzed. This means that it has to be sorted and synthesized in some manner. One way of solving this problem is to carefully integrate the data acquisition and data analysis program in some type of interactive manner. And that's one of the problems we'll cover in the next few months.

Pattern recognition is a complex field requiring a firm grounding in both computer science and mathematics. It is, however, vitally important to artificial intelligence research. Before a machine can make rational decisions about its environment it must be able to *recognize* its environment. □

The author can be reached to by writing or calling Merl Miller, dilithium Press, 30 N.W. 23rd Place, Portland, OR 97210, (503) 243-1158.

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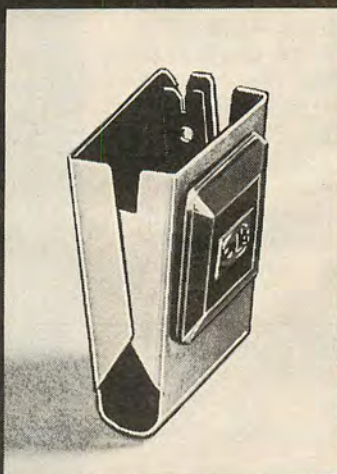
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Suppose you've bought a floppy disk drive with, say 12.8 megabits per floppy. That gives you quite a bit of program and data power. Now let's assume that you have some project that requires extensive file space, adding up to 12.9 megabits. So much for your single floppy. You will have to go out and buy another disk drive or hand load and unload two disks on the single drive you already have. The hand loading will mean you don't have to put out the cash for the second drive, but it would be quite cumbersome if the program expects more than a few disk changes. Buying the second drive will easily solve the problem (providing you can afford it) until, of course, you write another program that requires 37.5 megabits.

Suppose, however, that you stick with the one drive. Can the problem be solved without the hand loading and

unloading? The solution is to *automate the loading and unloading*. Why do by hand what can easily be done by a few gears, pulleys, solenoids and some digital control?

The diagrams accompanying this article show one possible setup. It is not much more than a modification of the jukebox, record-changing concept. But think of the potential. With just one floppy drive and an automated disk selector, your micro could have on-line access to, say, 51.2 megabytes of memory (with 32 floppies in the stack). Imagine what you could do with the entire Encyclopedia Britannica as part of your computer memory.

Granted, you will not get the same fast access time as having a disk drive for each floppy. But who could afford that? And who wouldn't sacrifice a little access time for mass memory on such a grand scale?

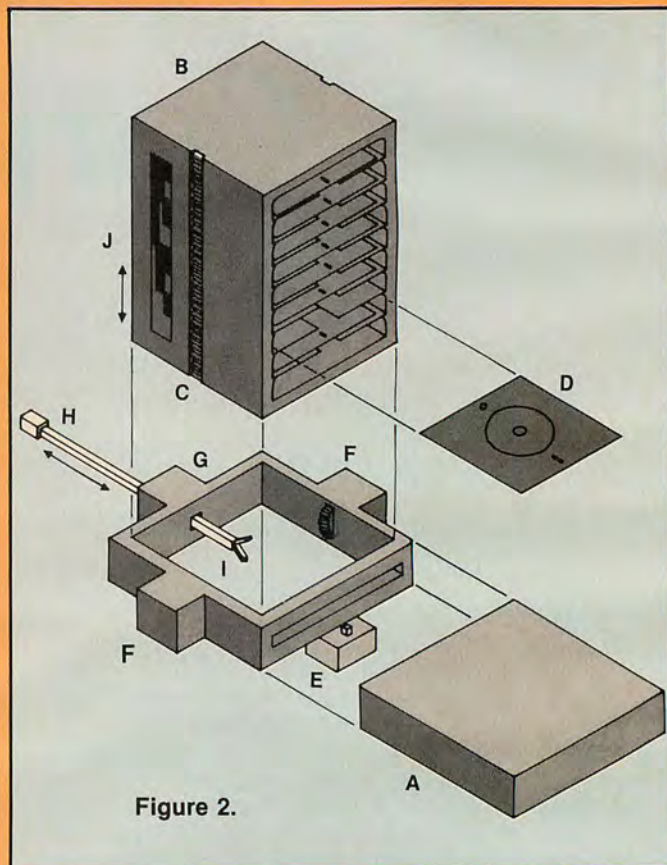


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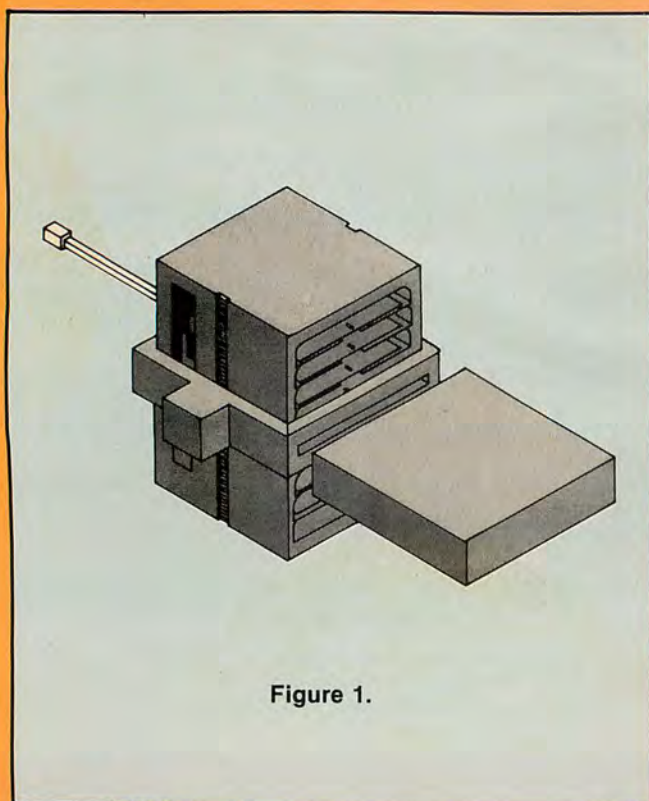


Figure 1.

Figure 1 shows an assembled version, but the 'exploded' view of Figure 2 depicts more of the detail of the hardware. A is the disk drive unit that receives the floppy disks from the disk selector. B is the disk stack which holds eight disks (in this particular setup), one of which (D) has been removed to show how they rest on slotted shelves in the stack.

On one side of the stack is a binary coding strip (J) which is used by the controlling processor to determine exactly when the requested disk is opposite the selector shaft (H). Also on the side of the disk stack is a geared rack (C) which, when the stack is properly placed in the rest of the unit, engages the gears at F.

It is these gears, under program control, which move the stack up and down to properly place the requested disk. At the front of the disk selection unit is a solenoid actuated arm (E) which is used to open and close the access door on the front of the disk drive (A). The selector shaft (H) has a 'grabber' at the inside end (I) which is used to grasp the disks during insertion and removal.

Look at a typical disk selection operation to get a better idea of how it would work.



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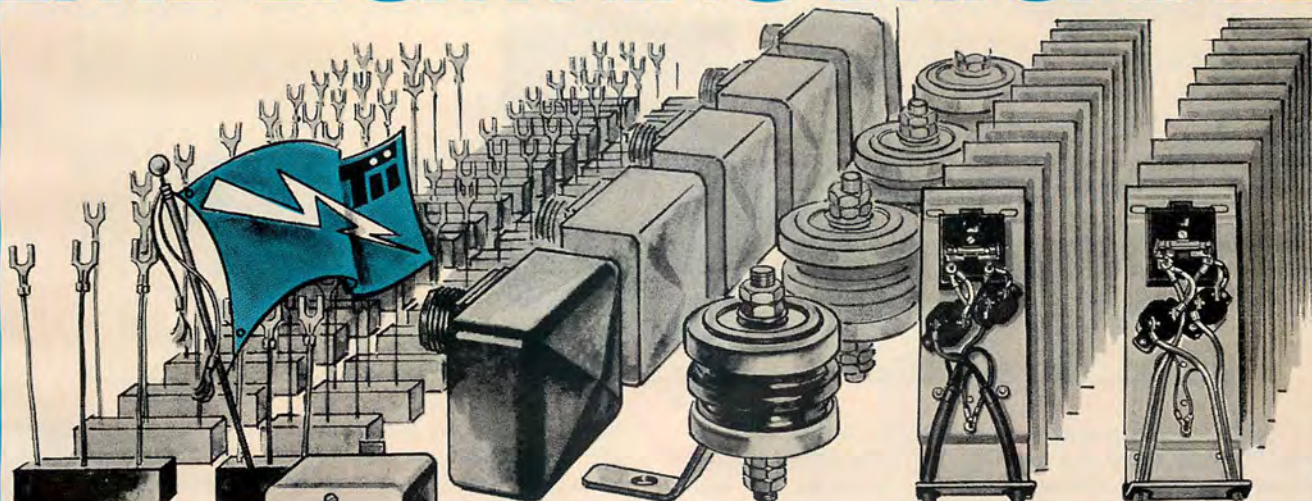
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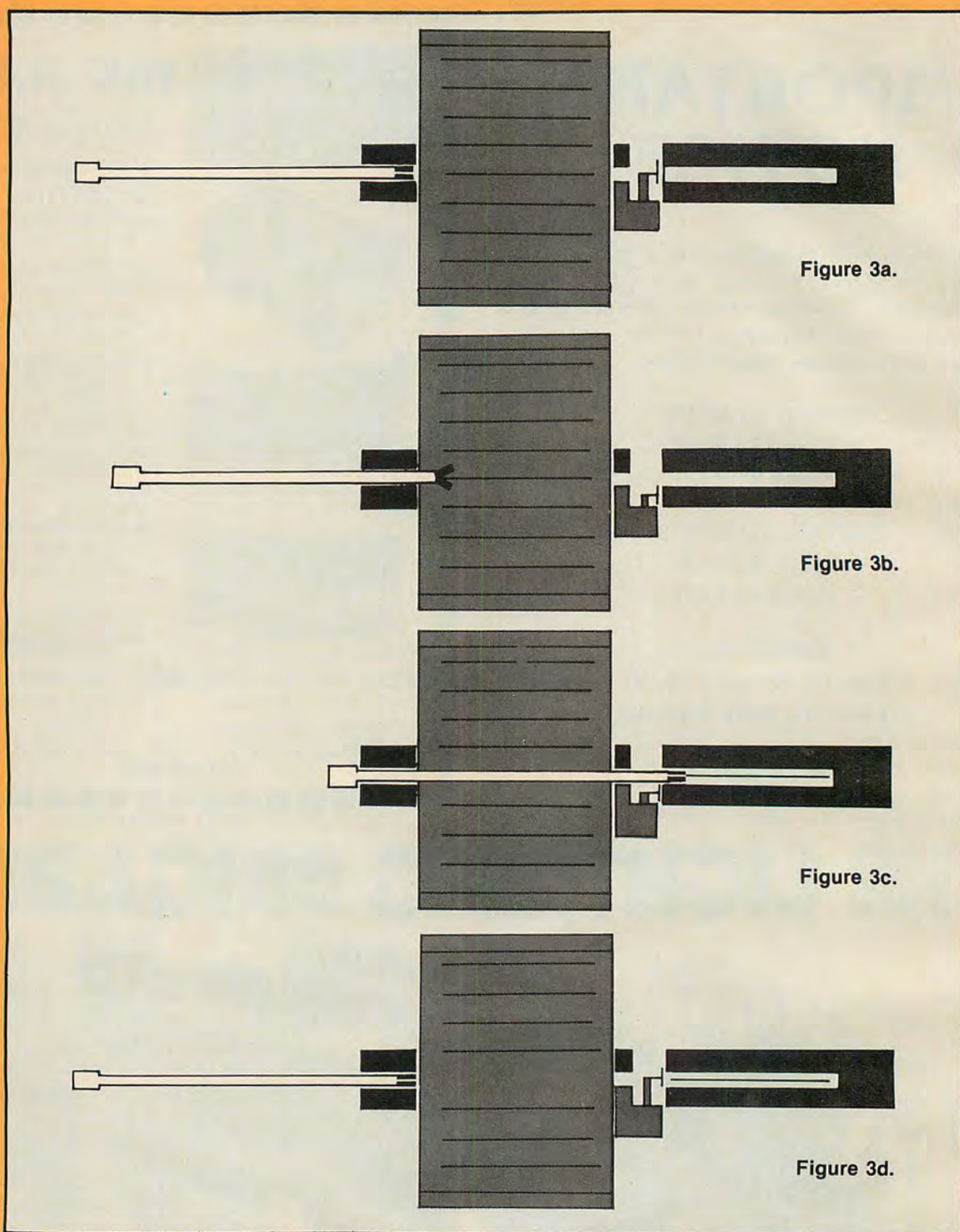


Figure 3 gives a series of simplified cutaway drawings. The disk drive is to the right, and the selector shaft is pointing out of the left side. In Figure 3a, the disk stack (the vertical rectangle in the center of the drawing) has been positioned so that disk number 3 (counting from 0 from the bottom) is ready to be inserted into the disk drive.

In Figure 3b, two things have happened; the door to the disk drive has been opened by the door-opening solenoid, and the selector shaft has moved towards the disk and grabbed onto it. In the next drawing (3c) the selector arm has pushed the disk completely into the disk drive. The final drawing (Figure 3d) shows the selector shaft completely withdrawn into a wait position and the disk drive door shut. The computer can now read or

write onto floppy disk number 3. To change to a different disk the procedure is reversed to remove the one already in the drive, and the newly requested disk is loaded. The essence of simplicity.

Undoubtedly, the disk selection device could be manufactured for about the cost of one of the smaller floppy drives (\$400 - \$600) and possibly less. The stacks could easily be made of lightweight plastic. It could even be made modular so that several stacks could fit together, one on top of the other, and all served by the same selector. The motors, solenoids, and such could be stock items; no accurately machined parts would be required. The whole thing could easily be driven by a few I/O ports and some simple software. There should be little difficulty in adapting it to the several brands of disk drives currently available. □



# INTRODUCTORY OFFER\* TRS-80 FLEXIBLE & DEDICATED INTERFACE



T Buss with T Print card, Vector prototype card, two optional connectors, and optional T Cry crystal oscillator.



TRS-80 print module.

**T BUSS** — a high-quality low cost six slot mother board that plugs directly into the TRS-80 computer and enables the user to simultaneously interface to a wide variety of peripherals and accessories. The type of peripheral interfaced to is determined by an additional board (standard size Radio Shack or Vector 44 pin) that plugs into one of the six buss connectors. Each T Buss comes complete with connecting cable, PC board, and one connector with edge guides.

**T CON** — Each T Buss is supplied with one soldered on Elco connector. Up to five additional connectors are available for those who wish to add more interface cards. All connectors purchased separately must be soldered on the T Buss by the end user.

**T BUSS (A)** — a standard T Buss with the five optional connectors factory soldered and tested.

**T CRY** — an optional on-board, fully buffered, 2 MHz crystal oscillator that can be used for timing and control.

**T POW** — an optional power supply that has been designed to power the T Buss when the Radio Shack power supply is not sufficient. It produces 3 amperes at +5 volts and 500 MA at +12 volts. In general T Pow is needed when the T Mem card is used with Level I BASIC, when four or more cards are used with Level I BASIC, and when any card is used with Level II BASIC that cannot draw power from the interfacing device.

**T PRINT** — parallel printer interface card that plugs into the T Buss (pictured above left) and provides line printing capabilities for the TRS-80 computer. All line print commands in Level II

BASIC can be used and assembly language will drive a printer with Level I BASIC. It may be configured for memory mapped or conventional I/O and with the selection of the proper cable the T Print card makes the TRS-80 plug-to-plug compatible with many popular printers.

**T PRINT CABLE** — a cable that connects the T Print card to the TRS-80 and the respective line printer. The Centronics/Axiom version makes the TRS-80 plug-to-plug compatible with printers that require a 36 pin connector. The Centronics 779, P1 and the Axiom EX-801 are several examples of printers that can be driven with this hardware. The Telpar version is identical to the above cable with the exception of the connector, which makes the PS-48C printer compatible to the TRS-80. In both cases power is taken from the printer power supply (the T Pow is not needed).

**TRS-80 PM (Print Module)** — a dedicated self-contained, line printer interface (pictured above right) that basically offers the same features as the T Buss, T Print, T Print Cable combination. Designed for those people who don't need the flexibility of the T Buss or the expense of the Radio Shack Expansion Interface. Simply plugs into the TRS-80 and respective printer. No other hardware is needed to interface to the Centronics P1, 779, Axiom EX-801 or Telpar PS-48C printers.

**FUTURE PRODUCTS** — memory, four port parallel I/O, two channel A to D and D to A, real time clock, serial interface, IEEE, EPROM, music and sound effects are some of the many plug-in-boards soon to be available for the T Buss.

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T Pow	\$79.95	_____	_____
T Cry	\$14.95	_____	_____
T Print	\$79.95	_____	_____
T Print Cable (Centronics/Axiom)	\$29.95	_____	_____
T Print Cable (Telpar)	\$29.95	_____	_____
TRS-80 PM (Centronics/Axiom)	*\$99.95	_____	_____
TRS-80 PM (Telpar)	*\$99.95	_____	_____
Texas residents add 5% sales tax			Total _____

\* As an introductory offer the price of the T Buss (A) and either version of the TRS-80 PM has been lowered to \$69.95 and \$79.95 respectively. All orders received through November 31, 1978 will be accepted at these prices.



# FROM THE FOUNTAINHEAD

By Adam Osborne

John Dilks did it again. His **PCC78 Computer Show** in Philadelphia was a smashing success — in contrast to many recent shows which have been sparsely attended and inadequately organized. I estimated that 12,000 visitors attended the show.

After IMSAI's absence from many recent shows I was pleased to see them exhibiting again at PCC. Their VDP systems look good, but have taken a long time becoming real. I was disappointed to see that Apple Computer Corporation never made it to the show, nor did any of the pre-microcomputer manufacturers who are now trying to get into microcomputers. Apple missed PCC, according to Gene Carter, because they were understaffed and overcommitted. I expect the pre-microcomputer manufacturers (such as DEC) still do not understand this new market.

There were no startling new exhibits at PCC 78; rather, there appeared to be a gradual improvement in the overall quality of systems — hardware and software combined. Soon they may be adequate.

The most interesting aspect of PCC 78 was the large attendance. It proves that there is still a large audience for these shows, but the audience is very discriminating. They go to the well-known, well-run shows, ignoring the many others. In the future I believe that Jim Warren's West Coast Computer Faire and John Dilk's PCC shows will definitely continue to succeed and draw crowds. One or two other shows each year may make it, but for the rest, good-bye. They are not needed and will not be missed.

**PASCAL** has had a lot of publicity recently. **PASCAL** is a programming language that has been around almost as long as **BASIC**. I think a little perspective is needed in the "PASCAL versus BASIC" argument which is now likely to rage.

Is **PASCAL** a more efficient programming language than **BASIC**? Definitely yes.

Is this difference relevant to you, the **BASIC** programmer. Definitely no.

**PASCAL** has been knocking around universities for years. From time to time, like the seven year locust, **PASCAL** reappears championed by some new Don Quixote. Then it fades away, as it surely will this time. It is amazing how everyone has said nasty things about **BASIC** for years but used it, while they have praised the virtues of **PASCAL** and ignored it. **PASCAL** does nothing that you cannot do in **BASIC**. **PASCAL** simply does it in shorter programs. The economic advantages of programming in **PASCAL**, a

more efficient language than **BASIC**, are far outweighed by the universal use of **BASIC**; and the vague compatibility that exists between **BASIC** programs, as compared to the complete lack of compatibility between **BASIC** and any new language, weighs heavily in favor of **BASIC**.

Do not be rushed into selecting **PASCAL** by the current propaganda; you may find the switch economically regrettable. If you do choose to program in **PASCAL** rather than **BASIC**, make your choice based on your own understanding of the two languages and now because you are frightened of being left behind.

There is an interesting **business possibility** that I would suggest readers look into. For many years automobile dealers were the largest single market for Wang Laboratories' 700-series and 600-series scientific programmable calculators. These programmable calculators with a typewriter output device sold for \$7,000 or more (right in the price range of today's microcomputer systems). Automobile dealers bought these expensive calculators because someone had written a very simple program that allowed the calculator to compute monthly payments for cars bought with any combination of options and payment plans. The program then typed out the purchase contract. I believe that the original auto dealer program was written by one programmer in approximately two months. It sold many thousands of expensive programmable calculators. These programmable calculators are probably very expensive to service, and it may be the time for enterprising microcomputer stores to contact their local automobile dealers and do a little upgrading business.

I have received a new flurry of **customer complaints** regarding products ordered by mail from manufacturers. Customers are once again getting very late delivery of defective products.

Let me slightly revise the rules which I believe we should live by:

1. Buy from a computer store, paying cash for what you can see, feel, and touch, or;
2. Buy from a reputable mail-order dealer paying C.O.D. if necessary, but not in advance. Never pay in advance.
3. Never deal directly with the manufacturer, but if you must, do not pay in advance or C.O.D. Pay only after examining what you received from the manufacturer.



The major change in my suggested policy is that I now approve of paying C.O.D. when ordering from reputable mail-order organizations, and I approve of these mail-order organizations in general. They are reputable because they do fill their orders promptly and they do not advertise products which they cannot ship. Moreover, the continued existence of mail-order companies depends on them operating ethically.

You might say the same logic applies to manufacturers, but manufacturers have for too long advertised what they do not have, and cashed checks sent in advance to build the product that they were supposed to have had ready for shipment. They then get into financial trouble and start shipping products which are not adequately tested.

That is why you can order C.O.D. from a mail-order company but not from a manufacturer. With a manufacturer you may wait six months to receive your order, and what you get may not work. Mail-order companies quickly spot defective products which they do not ship to their customers other than by mistake. And they will correct their mistakes quickly.

I mentioned Brice Ward in a recent column. Brice Ward is now doing business as **Bud Aaron** of Aaron Associates.

In another recent column I criticized established manufacturers who **time a warranty** from the date they ship products to a computer store, rather than from the date a computer store resells the product to you, the customer. In consequence, you may frequently buy hardware which you think is under warranty, but the warranty has expired while the hardware sat in the computer store's inventory.

I received a response from Mr. Robert C. Mooney who defended the manufacturers on the grounds that computer stores fiddle around with the hardware, in which case the manufacturer is entitled to pass on warranty responsibility to the store.

I agree that computer stores which open boxes and switch around cards cannot turn to the manufacturer with warranty claims. But what about hardware that comes straight out of the manufacturer's box and goes into a customer's system with little or no warranty because the box has sat in the store for a couple of months? That is the practice I would like to discourage. □

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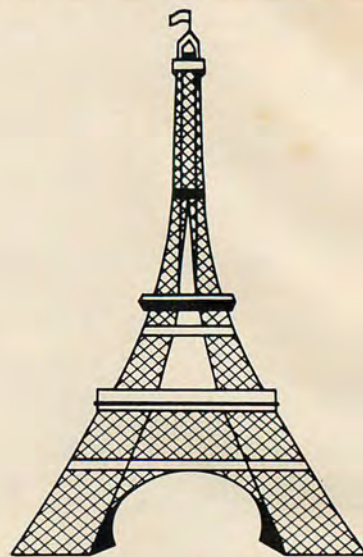
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CIRCLE INQUIRY NO. 53

# EUROPEAN



# INTERFACE

## THE COMMON MARKET, A MARKET NOT SO COMMON

The European Economic Community (EEC), also referred to as the Common Market, was created in order to encourage business between its members by simplifying procedures and abolishing customs duties. This has almost been achieved. Since the added value tax is still different from country to country, one has to complete a lot of forms to bring merchandise from one country to another.

Luxembourg is five car hours away from Paris and is a very small country in the middle of Europe. A computer dealer in France needed some equipment fast and decided to pick it up himself by car. Easy he thought; a 10-hour round trip and I have my computer. It turned out to be very different.

He tells his story as he experienced it. "My partner and I went to Luxembourg by car to visit IMSAI Europe and to pick up a microcomputer and a few boards. IMSAI was informed in advance about our coming, and helpful as they are, they had prepared the necessary customs forms which would allow us to return to Paris without stopping at the border. Our broker in Paris would then take care of the formalities on arrival of the goods.

"We left IMSAI at about 10:30 A.M. Everything had gone smoothly and IMSAI had packed the material nicely. No problem to leave Luxembourg: the papers were in order and the export formalities reasonable. 100 km down the road was the French border. We proudly produced our papers and told the officer we were on our way to Paris. He smiled at us and said, 'No way. With these papers you have to complete the formalities at the customs center which is about 50 km away.' So off we went, and arrived at the center at 11:45 A.M. just to learn that customs closed at 12:00 for lunch and wouldn't reopen until 2 P.M. In any case we had to take a broker to do the formalities.

"We talked to three different brokers, but they all refused to do the work for us since the paperwork seemed complicated and it was not big business anyhow. We asked a customs inspector what to do. His advice was to go back to Luxembourg and get the papers in order.



"We drove back to the border and left France without any problem, as they still remembered us. We got to the Luxembourg border, and we were not allowed to go back in. The friendly customs officer explained that we had no import papers. Of course we didn't have them, since we had no intentions of importing anything into Luxembourg. Now we were stuck between Luxembourg and France.

"Fortunately there was a phone nearby from which we could call IMSAI. They were trying to help us but without much success. Now we started a completely different procedure. We sneaked by the Luxembourg guard and started all over again. We took a broker on the Luxembourg side to prepare new export papers. With these papers we got back into France. We went back to the customs center where the same broker also had an office, and he completed the French papers for us. Only in the meantime, we became very suspect to the customs people and they turned the car upside down. When we left it was 6 P.M. It took us a whole day to get a microcomputer through customs. We do not know if one day in Luxembourg they will realize that the same machine had been exported twice."

This is just one story of many to illustrate how different business can be in Europe.

### MICRO/EXPO 1978

The third Micro/Expo took place in Paris at the U.S. Trade Center (USTC) and has established a new visitor record for the USTC. About 50 different companies presented a large number of products which covered pretty much everything available on the U.S. market. To name just a few which were shown, ALTAIR, APPLE, COMPUTALKER, HEATHKIT, ICOM, INDUSTRIAL MICRO SYSTEMS, IMSAI, INTERFACE AGE, MICRO COMPUTER DEVICES, NORTH STAR and PET were all represented.

The majority of the visitors were professionally oriented, but the hobbyist attendance had increased. This was also proven by the large number of people who participated in the late afternoon sessions. One session was devoted to "Microcomputers for Personal Use," with the participation of one person each from the first computer stores in France, Euro Computer Shop and Computer Boutique. The room was absolutely packed. Unfortunately, after about one hour a security guard had to ask for some people to leave because the attendance was above the permissible level.

Micro/Expo is certainly the most important microcomputer show in France and one of the key shows in Europe. It is also extremely popular.

Next year it will not take place at the USTC. One reason is the increasing number of people to handle, the other is to open the show also to non-American products which unfortunately cannot be exhibited at the USTC.

### A FRENCH COMPUTER CLUB

Computer clubs have finally arrived in France. A new club OEDIP has just been formed. Their objective is to develop interest in personal computing by providing courses in programming, assisting people in the selection of equipment, evaluating available equipment and providing access for the members to systems owned by the club. The people who have created this club are very dynamic, and we believe that they will be successful and will play a major role in the development of personal computing in France. For those clubs or hobbyists in the USA which would like to have European contacts, here is the full address:

Organisme d'Etudes et de Developpements in Informatique Personnelle (OEDIP); 8, Place Sainte-Opportune, 75001 PARIS, telephone Paris, 508-46-21. President: Mr. Laurent de Villemorin. □

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Product Description

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(714) 894-9131    Marty Rezmer  
**NORTHSHARE™**  
Time-Sharing North Star Floppy Disk Basic System
- **Command, Control and Communications Corporation**  
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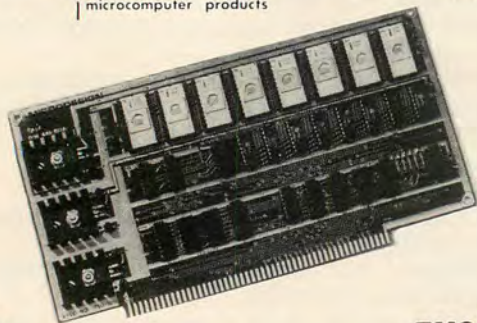
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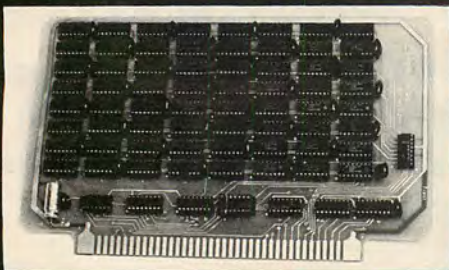
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## SL80-11

8080 Text Processor (Paper Tape, Disk)

## PUBLISHED SOFTWARE

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### • ART

#### Low Cost Graphics (8800)

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#### Alfred E. Newman

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#### Richard M. Nixon

Basic Software Library v 1 p 257

#### Noel, Noel

Basic Software Library v 1 p 259

#### Nude

Basic Software Library v 1 p 264

#### Poster

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## Policeman

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## Road Runner

Basic Software Library v 5 p 889

## Mrs. Santa

Basic Software Library v 1 p 254

## Santa

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## Santa's Sleigh

Basic Software Library v 1 p 275

## Serendipitous Circles (6800)

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## Silly Woman

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## Virgin

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#### Relocatable Assembler (8080)

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#### Tiny Assembler (6800) "Paperbytes"

Byte Interface Technical Services

#### Expanding Tiny Assembler (6800)

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#### Basic Cross Assembler for the 8080

INTERFACE AGE Feb78 pp 79-81

#### M6800/Fortran Cross Assembler

INTERFACE AGE Oct77 pp 152-154

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Errors to the above program  
INTERFACE AGE Dec77 p 134  
8080 Bug Chaser  
SCCS Interface Feb76 pp 24-25

#### • BOOTSTRAPS

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**Bootstrap Loader (8080)**  
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**PROM Bootstrap Loader (8080)**  
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#### • BUSINESS

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**Contract Form Program (SWTPC 8K v 2.0)**  
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#### Depreciation, Simple

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#### Depreciation, 4 Methods

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#### Depreciation Amount (PET)

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#### Depreciation Rate (PET)

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#### Depreciation Schedule (6800)

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#### Discounted Commercial Paper (PET)

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#### Federal Withholding Taxes (PET)

Some Common Basic Programs p 162

#### Financial Projection for Investors

Basic Software Library v 4 p 722

#### General Ledger Program (8080)

INTERFACE AGE Floppy ROM™ Sept77 pp 32a-32b

##### Utility Programs

Alter Data

Enter/Edit Source Document

Check/Voucher Register

General Ledger Figure

Balance Sheet Figure

Month-to-Date Account Number

Bank Reconciliation

Check Transactions

Journal Vouchers

Monthly and Year-to-Date Budgets

System Boot

General Ledger File Sort

Listings: INTERFACE AGE Nov77 pp 57-73

#### General Ledger (WANG 2200)

Adam Osborne & Associates

Accumulation of Payable/Receivable Postings

Trial Balance

Income/Expense Statement

Balance Sheet

#### Inventory, Simple

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#### Inventory (Revised)

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#### Inventory Management

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#### Inventory Modification

Basic Software Library v 3 p 573

#### Inventory Pricing, CAI (2 Programs)

Calculators/Computers May77 p 55

#### Lease vs. Equipment Purchase

Basic Software Library v 1 p 21

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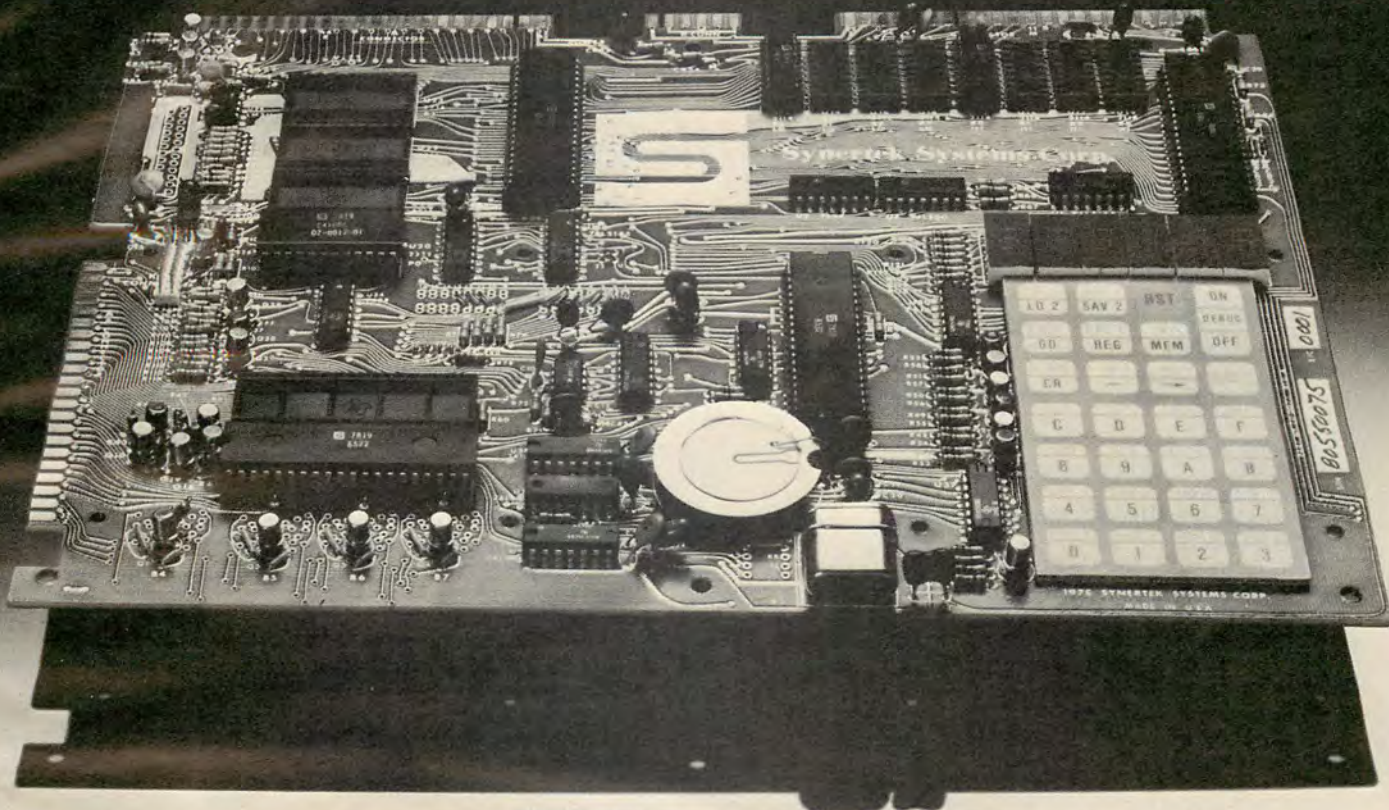
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**Multiple Column Accounting (MITS Altair 8K v 4.0)**

Dr. Dobbs #19 pp 40-41

**Optimum Order Quantities**

Basic Software Library v 1 p 80

**Payroll Program (modified)(6800)**

Kilobaud Dec77 pp 45-46, 48

**Payroll Programs, CAI**

Calculators/Computers May77 p 70-74

**Payroll Register**

Basic Software Library v 8 p 580

**Payroll for Small Business (6800)**

Kilobaud Nov77 pp 107-108

**Payroll with Cost Accounting (WANG 2200)**

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**Payroll Programs**

ROM Sept77 pp 89-95

File Maintenance

File Updates

Year-to-Date

Quarterly Reports

Initialization Files

**Payroll Modifications**

Basic Software Library v 3 p 589

**Payroll (NOVA)**

Personal Computing Mar/Apr77 pp 27-28

**Pert Tree Network**

Basic Software Library v 1 p 85

**Purchase vs. Making of an Item**

Basic Software Library v 1 p 29

**Profit Analysis**

Basic Software Library v 4 p 787

**Rate of Return on Investment**

Basic Software Library v 1 p 95

**Rate of Return on Leased Investment**

Basic Software Library v 1 p 102

**Retail Pricing System (SWTPC 8K v 2.0)**

Kilobaud July78 pp 109-110

**Revolving Charge Account Calculations**

Kilobaud July78 pp 34-35

**Risk Analysis Program**

Basic Software Library v 3 p 595

**SBA Loan Repayment Schedule**

Basic Software Library v 4 p 811

**Sales Analysis (8080)**

Kilobaud May77 pp 34-35

**Sales Receipt Tally (6800)**

Kilobaud Oct77 pp 29-30

**Scheduling Assignment**

Basic Software Library v 3 p 627

**Simplified Billing System**

Kilobaud June77 p 95ff

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**Tax Depreciation Schedule (PET)**

Some Common Basic Programs p 168

**Transaction Statement (ALTAIR Disk Extended)**

Personal Computing Apr78 p 55

**Withholding Payroll Tax Update**

Basic Software Library v 6 p 1077

**• DEBUG**

Octal Debugging Program (8008)

INTERFACE AGE Mar77 pp 121-124

**• DECIMAL**

Decimal Input Routine (8080)

Computer Notes Nov/Dec75 p 20

**• DECISION MAKING**

Computer Decision Making Program

Kilobaud July77 p 95

**• DIET**

Basic Diet Planning (8080)

ITNERFACE AGE Oct76 pp 26-42

**• DISASSEMBLER**

— 6502 —

**Pseudo-Disassembler**

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**Disassembler for MOS Technology 650X**

Dr. Dobbs #21 p 6

**Disassembler**

INTERFACE AGE Sept76 pp 14-22

Object Code Search routine for the above program

INTERFACE AGE Oct77 p 146

**Disassembler (APPLE)**

Dr. Dobbs Sept76 pp 22-25

Modifications to the above program for KIM I

Dr. Dobbs #20 pp 12-13

— 6800 —

**Disassembler**

Dr. Dobbs Mar77 pp 30-33

**Introducing the Disassembler**

Kilobaud July77 pp 60-65

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SCCS Interface Feb76 p 34

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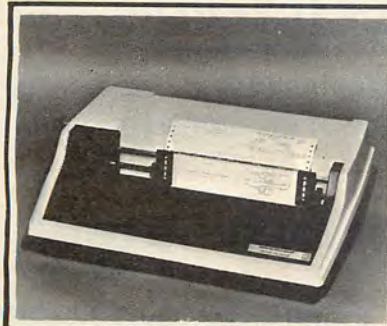
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Part IV: Octal Debugging

INTERFACE AGE Mar77 pp 121-124

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Dr. Dobbs Jan77 pp 16-62

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Pilot, Experimental Version (Z-80)

People's Computers Mar/Apr77 pp 4-5

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Dr. Dobbs #23 pp 22-45

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Addout and Address Programs

ROM Feb78 pp 25-28

Barebones Mailing List

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Instant Basic p 103

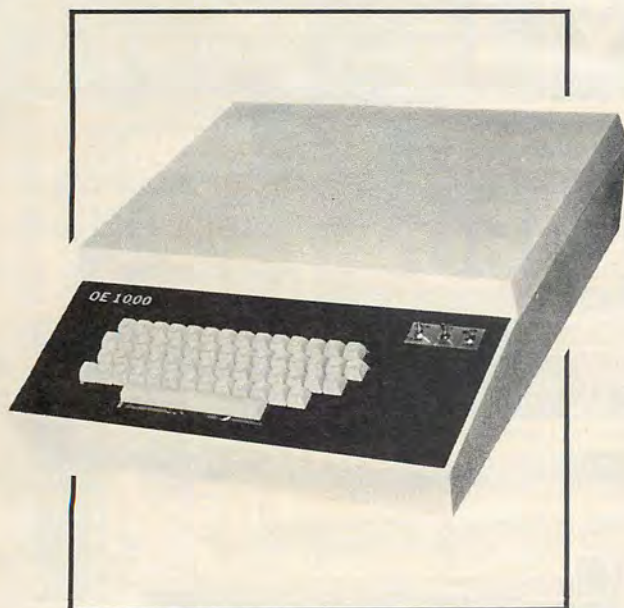
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Converts to Robert H. Uiterwyk's Basics pp 73-74

Converts to Fast Typist Mode for Uiterwyk's Basic pp 74-77

Converts to Fast Typist Mode for Altair 680b pp 77-79

### International ASCII Publication Standard (8080)

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Load and Dump Format

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### BASIC — Tiny

#### Casual (8080)

Dr. Dobbs Nov/Dec76 pp 25-32

#### Denver (8080)

Dr. Dobbs Mar76 pp 20-30

Corrections: Dr. Dobbs Sept76 p 34

#### Minol, Tiny Basic with Strings (8080)

Dr. Dobbs Apr76 pp 9-17

Corrections: Dr. Dobbs June/July76 p 36; Aug76 p 32

#### NIBL, Tiny Basic for SC/MP

Dr. Dobbs Nov/Dec76 pp 34-50

#### NIBL, Extended Tiny Basic (SC/MP)

INTERFACE AGE Jan77 pp 106-124, 128

#### Palo Alto v 3.0 (8080) (Z-80)

PCC's Reference Book pp 64-88

#### Palo Alto Tiny Basic (8080)

Dr. Dobbs May76 pp 12-25

Corrections: Dr. Cobbs June/July 76 p 35

#### Palo Alto by Dr. Wang (8080)

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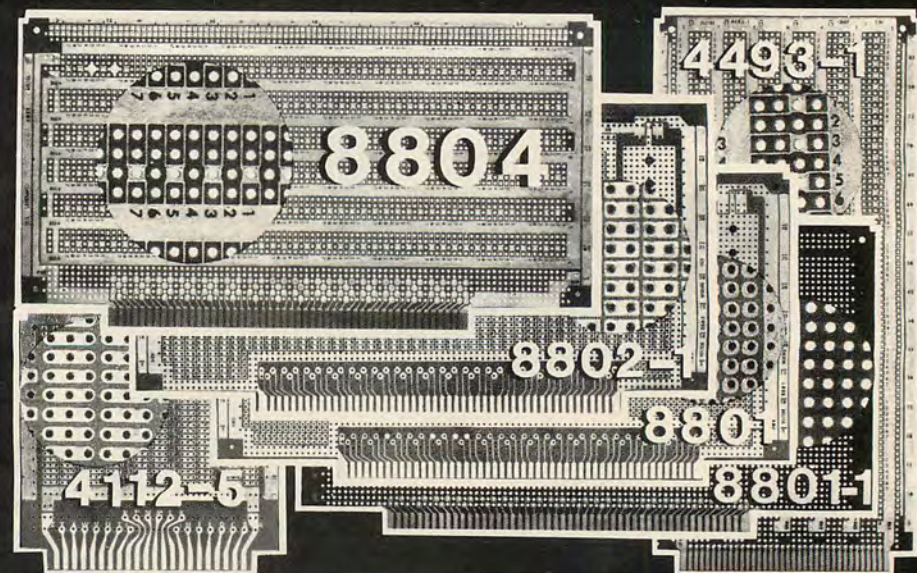
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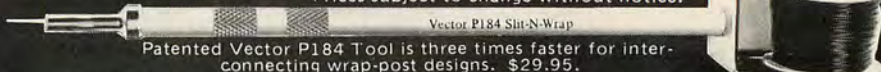
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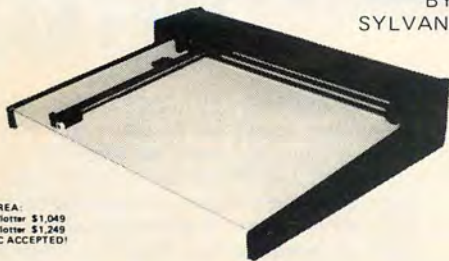
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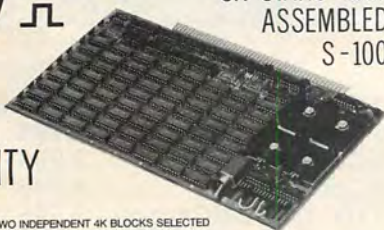
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INTERFACE AGE Feb77 pp 104-108, 120

Floating Point Routine (6502)

INTERFACE AGE Nov76 pp 103-111

Floating Point Routines (6502)

Dr. Dobbs Aug77 pp 17-19

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Dr. Dobbs #20 pp 17-21 nb: Also listed as —

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### FLOPPY DISK

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Byte June77 pp 92-96

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ISIS: Intel Systems Implementation Supervisor (PL/M)

Dr. Dobbs #21 pp 13-17

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INTERFACE AGE May78 pp 152-154

Interrogation Routine for Track Sector Headings (6800)

Byte Jan78 p 68

Routines to Write/Read Disk Data (6800)

Byte Jan78 p 70

### HEXADECIMAL

Blitz Drill (6502)

The First Book of KIM pp 38-39

Convert 6800 Hex to Intel Format

INTERFACE AGE May77 pp 109-110

Hexadecimal to Decimal Conversion

Kilobaud Aug77 p 105

M6800 Hex Dump to Print Program

SCCS Interface July76 pp 45-46

### HOLIDAYS

Western Easters: 1978 to 2001 (Palo Alto Tiny)

ROM Feb78 p 68

### HOMEBREW

David Brader's Kompuatar Front Panel Service

Byte Nov77 pp 136-137

### HOUSEHOLD MANAGEMENT

Budgeting, Recursive

Personal Computing May/June77 pp 54-59

Checkbook Balancing

Basic Software Library v 8 pp 1241-1243

Checkbook Balancer (SWTPC 4K v 2.0)

INTERFACE AGE May77 p 126

Checkbook Reconciliation

Basic Software Library v 8 pp 1234-1238

Financial Behaviorism (North Star BASIC)

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Home Accounting System (SOL)

Access Nov77 pp 18-20

Household Finance System

INTERFACE AGE Dec77 pp 54-55

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Home Stock Analysis

Kilobaud Dec77 p 91

Household Monthly Finance System

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**Earned Interest Table (PET)**

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**Effective Interest Rate of an Investment (PET)**

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Annual Depreciation

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**Future Value of Regular Deposits (PET)**

Some Common Basic Programs p 3

**Initial Investments (PET)**

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**Installment Loan Accrued Interest**

Basic Software Library v 8 pp 1264-1265

**Installment Loan Rule of 78s**

Basic Software Library v 8 p 1248

**Installment Loan Monthly Payments (Revised)**

Basic Software Library v 8 p 1259-1262

**Installment Payments with Interest on Unpaid Balance**

Guided Tour to Computer Programming p 144

**Installment Loan's True Interest**

Basic Software Library v 1 p 92

**Installment Payments with Add-On Interest**

Guided to Tour to Computer Programming p 142

**Interest Calculations, Simple (Pittman's Tiny BASIC) (6502)**

Kilobaud June78 p 43

**Interest and Compound Interest**

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**Loan: Annual Rate of Interest (PET)**

Some Common Basic Programs p 41

**Loan: Last Payment (PET)**

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**Loan: Principle (PET)**

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**Loan: Regular Payments (PET)**

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**Loan: Remaining Value (PET)**

Some Common Basic Programs p 36

**Loan: Term (PET)**

Some Common Basic Programs p 38

**Loan Payment Program**

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**Minimum Investment with Withdrawals (PET)**

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**Monthly Installment Loan Payments**

Basic Software Library v 1 p 51

**Basic Mortgages**

People's Computers May/June77 p 47

**Mortgage Schedules (Revised)**

Basic Software Library v 8 pp 1268-1269

**Mortgage Amortization Table (PET)**

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**Mortgage Terms: Comparisons**

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**Nominal Interest Rate on Investments (PET)**

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Some Common Basic Programs p 5

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Some Common Basic Programs p 7

**SBA Loan Repayment Schedule**

Basic Software Library v 4 p 811

**Savings Interest**

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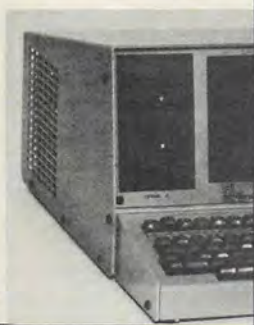
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Dr. Dobbs #21 pp 39-46

### Disassembler

Dr. Dobbs Mar77 pp 25-29

### Disassembler

Dr. Dobbs Feb77 p 30

### • DISK

Disk Timesharing to Read Non-Timesharing Diskettes (8080)

Computer Notes Nov77 p 7

Disk Utility Manipulation Program v 5.1

Basic Software Library v 7 pp 1172-1178

I/O Driver Program (8080)(Z-80)

INTERFACE AGE Sept77 pp 151-155

I/O Drive Routines (8080)

Byte June77 pp 92-96

Patch to MSI's FD 8 Disk System for Output Information

Dr. Dobbs #18 p 44

Super Simple Disk Boot (8080)

Byte Mar78 pp 183-184

Translate MITS 8K Basic into Format to Run 3.4 Disk Basic

ROM Feb78 pp 86-87

Z-80 Development System/Disk I/O Keyboard Handler

INTERFACE AGE Sept77 pp 167-168

### • DRIVER

Modified VDM-1 Driver by Li Chin Wang

Dr. Dobbs Nov/Dec77 pp 13-14

Modified VDM-1 Driver

Dr. Dobbs #20 pp 13-14

### • EDITOR

Fylstra's "Sweets" Editor (KIM)(6502)

Byte Feb78 p 62

Revisions to the above program

Dr. Dobbs #25 pp 37-39

Format Updating Original Newsletter SWTPC Editor to

SWTPC Do-Resident Editor/Assembler (6800)

Dr. Dobbs #20 p 30

Mini-Editor for 8080 Pilot

Dr. Dobbs #22 p 44

Tiny Linkage Editor (8080)(Z-80)

Dr. Dobbs Mar77 p 9ff

### • ELECTRONICS

Bias Circuit Design

Computer and Programming Guide for Engineers p 206

Butterworth Active Filter Program (IMSAI)

73 Apr78 p 89

Calculates Low Pass Filter Components

Basic Software Library v 2 p 304

Coil Design (Digital Group)

73 Mar78 pp 99-102

Computerized Wireless AC Control

Byte Apr78 pp 124-125

Controlling Expanded Digital Voltmeter Program

Byte Jan78 pp 52, 54

Convolutions in Time Domain

Basic Software Library v 2 p 300

### • FINANCE

Accrued Installment Loan Interest

Basic Software Library v 1 p 57

Amortization Schedules (Altair Disk Extended)

Personal Computing Apr78 pp 50-51

Annuities: Payments and Withdrawals

Basic Software Library v 4 p 763

Annual Interest Rates

Basic Software Library v 4 p 799

Annual Investment Rate of Return

Basic Software Library v 1 p 61

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Basic Software Library v 1 p 11

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Basic Software Library v 8 pp 1252-1253

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# • MAPS

## **Chorepleth Mapping, CHAMPS**

Creative Computing, Nov/Dec76 pp 72-74

## **Distance in Statute Miles with Bearing (6800)**

Byte July77 pp 118-119

## **Latitude and Longitude within Known Variables**

Basic Software Library v 2 p 426

## **Latitude and Longitude from Sextant Readings**

Basic Software Library v 2 p 332

## **Map Check (PET)**

Some Common Basic Programs p 178

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## **Penpal Matching**

Byte Jan76 p 49

## **People Matching (AppleSoft)**

Personal Computing June 78 pp 58-59

# • MATHEMATICS

## **Abundant and Deficient Numbers**

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## **Amicable Numbers**

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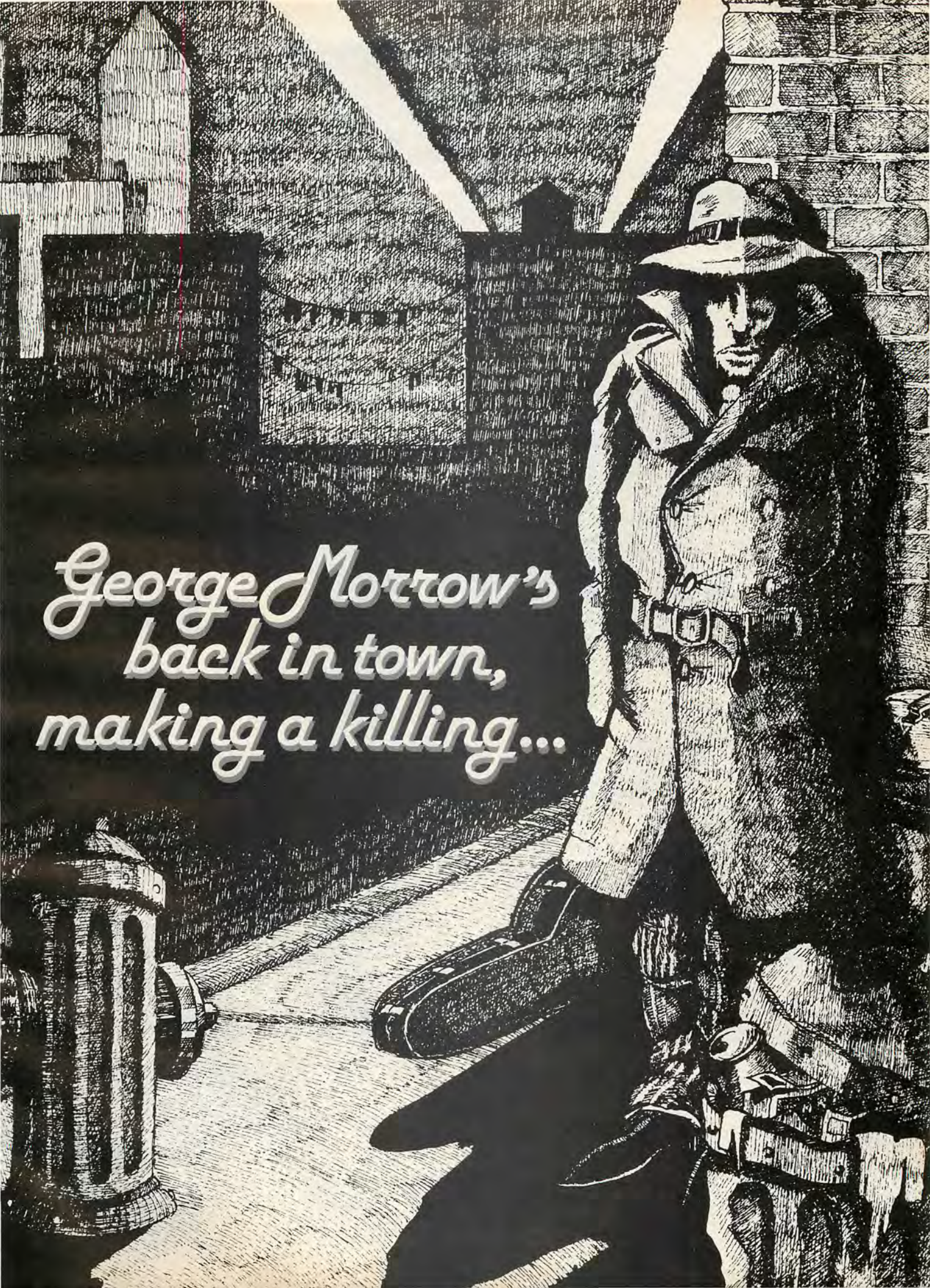
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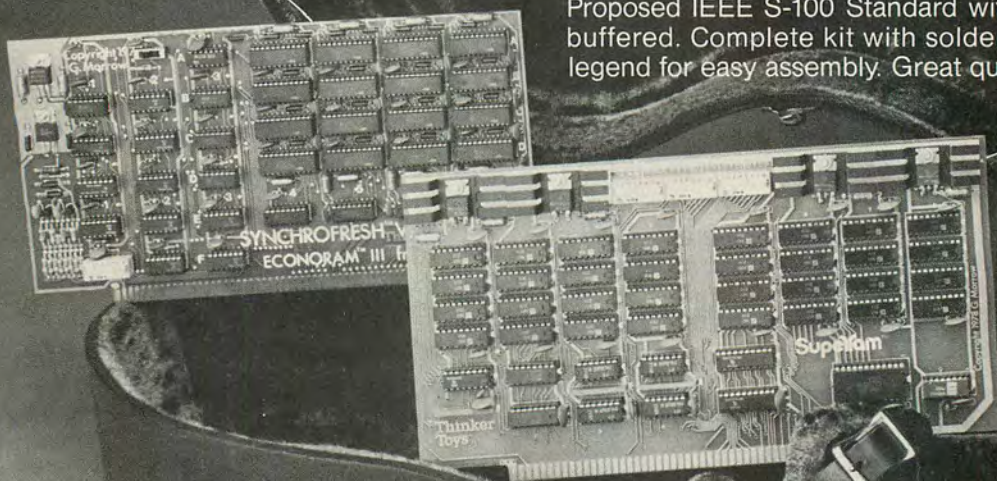


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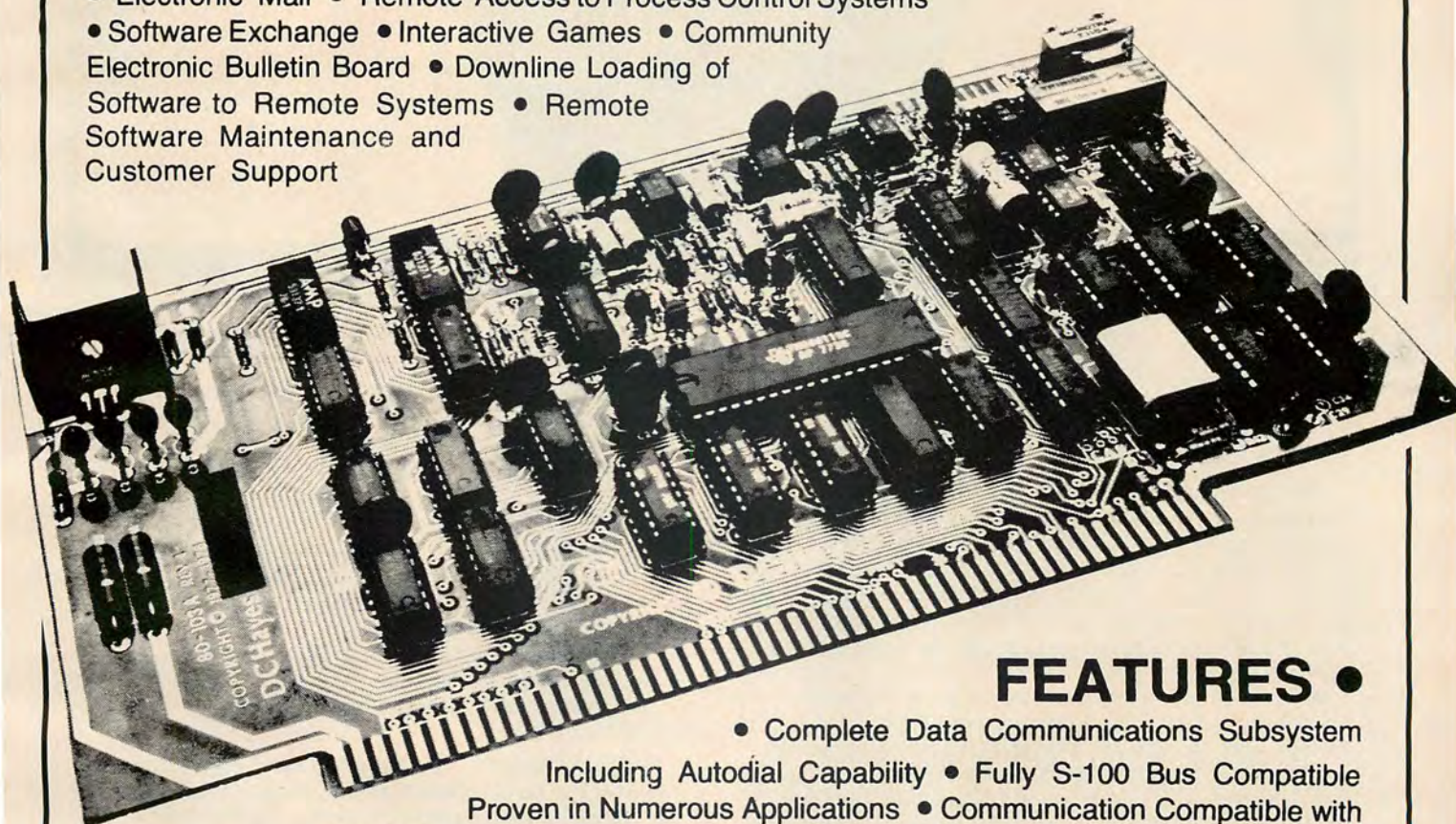
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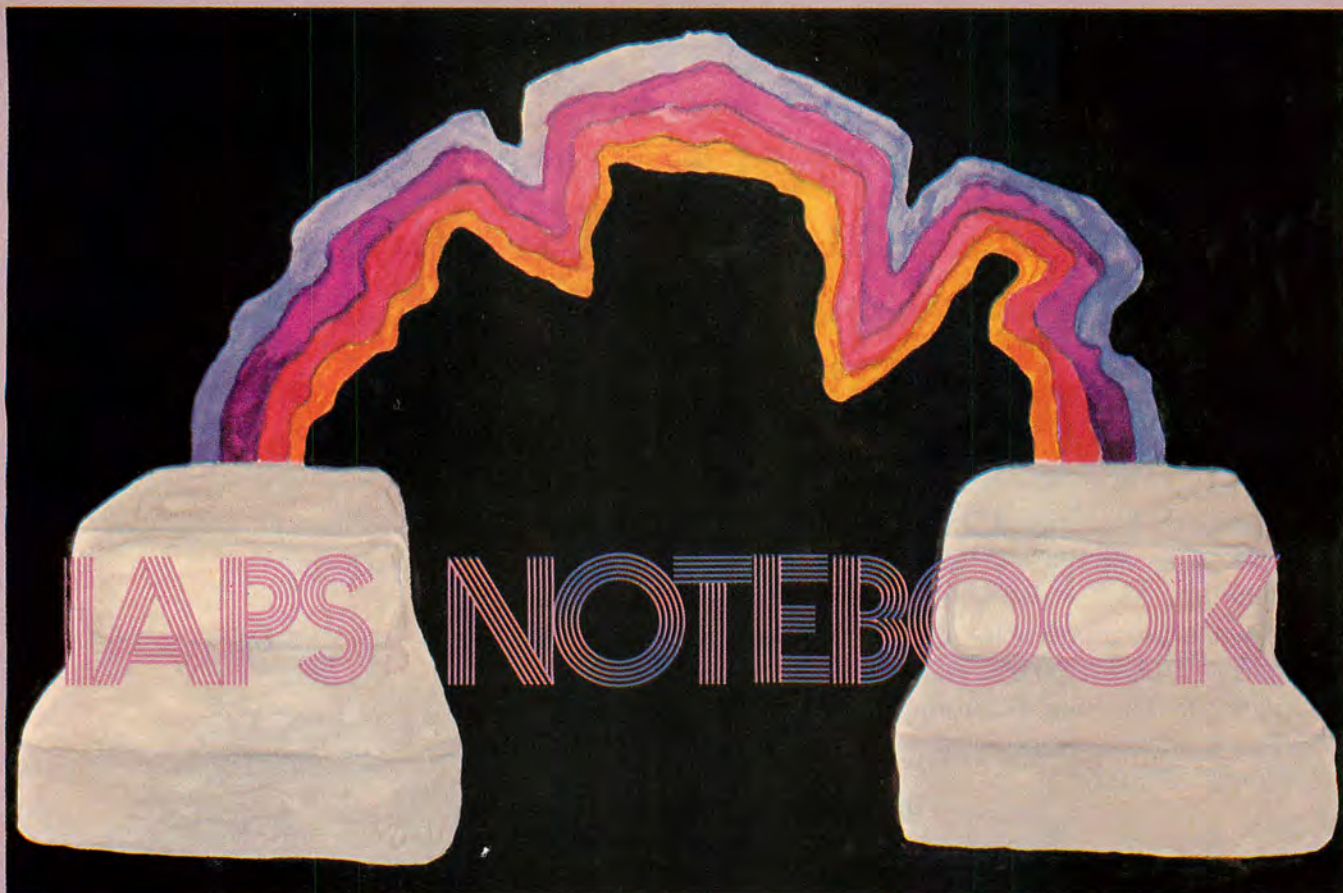
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By Bill Turner,  
Southeastern Regional Editor

## INTERNATIONAL ASCII PUBLISHING STANDARD

The IAPS\* (International ASCII Publishing Standard) was designed to eliminate the difficulties in transferring usable programs and data bases between different computer systems. Currently, hardware architectural design, port assignment differences, operating system and media constraints make it almost impossible to distribute a software package that can be loaded into any system.

IAPS is a software data transmission format which complements existing hardware standards such as the Kansas City format for 300 baud cassette recordings.

The IAPS format allows upward compatibility for future expansion, and the format has been specifically designed to allow both control information and data to be inter-mixed. Control information has been provided for error correction, data set and author identification. Provision has also been made to identify the creation date, computer and operating system used.

With the appropriate extensions, IAPS is also suitable for use as a computer to computer communications protocol. (A proposed standard is currently undergoing preparation to define this usage of IAPS.)

## PROGRAM OR DATA BASE PUBLICATION

Publication of programs using the IAPS format is very simple:

1. The program or data base is developed using the soft-

\*IAPS is a trademark of INTERFACE AGE Magazine, Cerritos, California 90701.

ware and system utilities as provided with the development system.

2. After development is complete, a special purpose conversion program is used to convert the format of the data or program into the standard IAPS format.
3. Transmission is accomplished by whatever means available, such as cassette tape, telephone couplers or modems, radio transmission, Floppy ROMs™, etc.
4. Upon receipt of a transmission file, the recipient would then run a customized conversion program to translate the standard IAPS format into one acceptable to his computer system.
5. The program can now be loaded into the computer and manipulated as necessary using the normal loaders, text editors, assemblers, compilers, or other system utilities.

IAPS, therefore, is designed to supplement, not replace, the data formats as designed into your system by your equipment manufacturer. At the same time, IAPS is designed to minimize your work in loading any programs or data bases published in the IAPS format.

## LOADING A PUBLISHED PROGRAM

The user would only need to load a customized IAPS conversion program and use it to convert the "published" format into the format required by his computer system. If any errors were detected during the conversion process, the user would be requested to read the IAPS formatted tape again. If errors were again detected, he would normally be given one of three choices:

1. Accept the "bad" lines.
2. Load the program without the "bad" lines.
3. Enter some corrections through the keyboard before loading the program.

The IAPS formatting rules are presented here in the



hope that equipment manufacturers, software houses, and users will distribute software to other users in a single, common, standard format.

It is further hoped that the equipment manufacturers will provide conversion programs to translate from IAPS into their own locally designed format as part of the operating system software.

Any problems, questions or suggestions should be addressed to IAPS, c/o INTERFACE AGE Magazine, 16704 Marquardt Avenue, Cerritos, CA 90701. Please write, rather than telephone, as the author of IAPS is currently located in the Southeastern Regional Office in Florida. Individuals interested in writing IAPS conversion programs should also write to obtain additional information on how the programs should be designed to allow upward compatibility. If necessary, a return phone call will be made to further discuss any questions or problems.

## IAPS SPECIFICATIONS

Proper formatting of IAPS messages requires use of several special control characters. Specific data formatting rules are provided in the description of the various component parts of IAPS as described below.

### TRANSMISSION FILE

A program or data base published in IAPS is called a transmission file. A data transmission file contains a header record and one or more records ("blocks") of data in a specified format. The final data record will be followed by a file control trailer record and a single EOT character to mark the end-of-file. All loading activity stops when an EOT character is detected, even if the character is detected in what appears to be the middle

of a transmission record. This rule applies even when the data transmission file is identified as being in a "Binary" format. For additional information, see the section on Binary Format.

### Record Formats

The following descriptions define in general terms the three types of records that may be present in a data transmission file.

Each of the three types of records have the same basic format: a sequential record number, a "text" section, and a checksum number.

The three records (Header, Trailer, and Data) differ only in their use of the "text" portion of the record.

Each record is variable in length and can be broken down into three sections.

The first section contains control information, such as a record identification number, which is used for error recovery.

The second section is "pure" text and may not contain any control characters other than those inserted by IAPS. Any control characters found in "user defined" text will automatically be translated into a special two-byte sequence to prevent any interference to the IAPS transmission.

The third section has four specially formatted characters that make up a checksum to verify accuracy of the received data.

The first section is preceded by a SOH character. A STX character is used as a separator between the first and second sections, while an ETX character is used as a separator between the second and third sections. There is no separator character after the four checksum characters, and any characters found there, with the sole exception of an EOT, should be ignored. The next block, if present, will start with a SOH character.

Each of the three sections are common to all record formats (header, text, and trailer), and are described in detail in the section titled Detailed Transmission Record Format.

### HEADER RECORD

The header record is used to identify the various options used to create the data file. These options include such items as creation date, version number, and file name. Also included are options such as maximum record size, and optional IAPS features used. The actual data format and description of each field is described in the section Header Record Format.

### DATA RECORD

The data record has the actual program text or data base being transmitted. Only IAPS defined and generated control characters may be present in the text portion of a data record. Any control characters found in the user supplied text will be translated to avoid interference with the IAPS format. Character and keyword compression techniques may be invoked to improve transmission efficiencies.

### TRAILER RECORD

The trailer record is an exact duplicate of the header record, with the exception of the record count field. (The record count field is optional on the Header record, but is a required field on the Trailer record.)

### IAPS HEADER/TRAILER RECORD FORMAT

The Header and Trailer records are identified by a record identification number of 0 (zero). In addition, the first 5 bytes of the text portion of the record will contain an identification constant. The first byte of the identification constant is a RS character (HEX '1E'). The second through fifth characters will be either 'HDR1' or 'EOF1'.

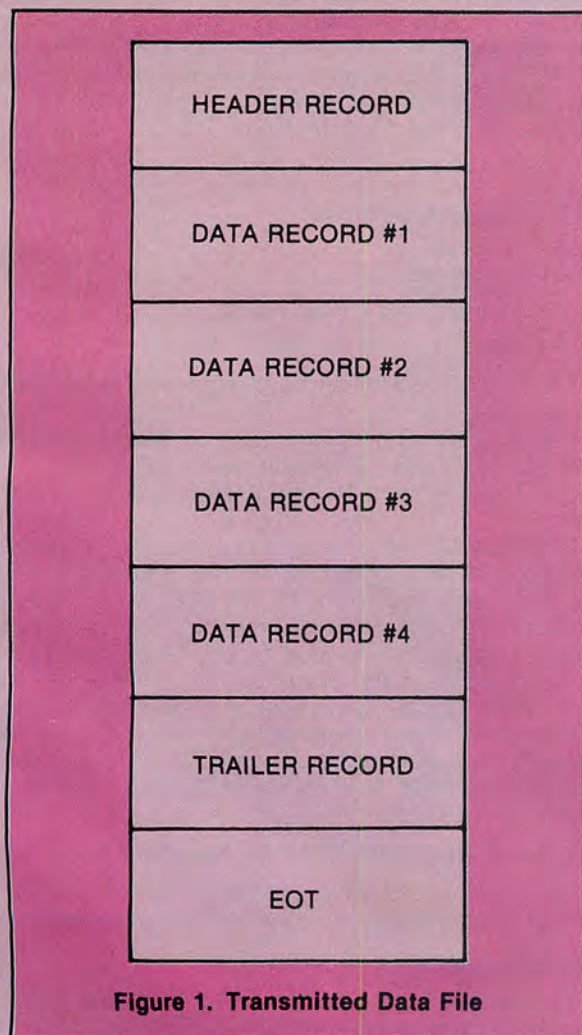
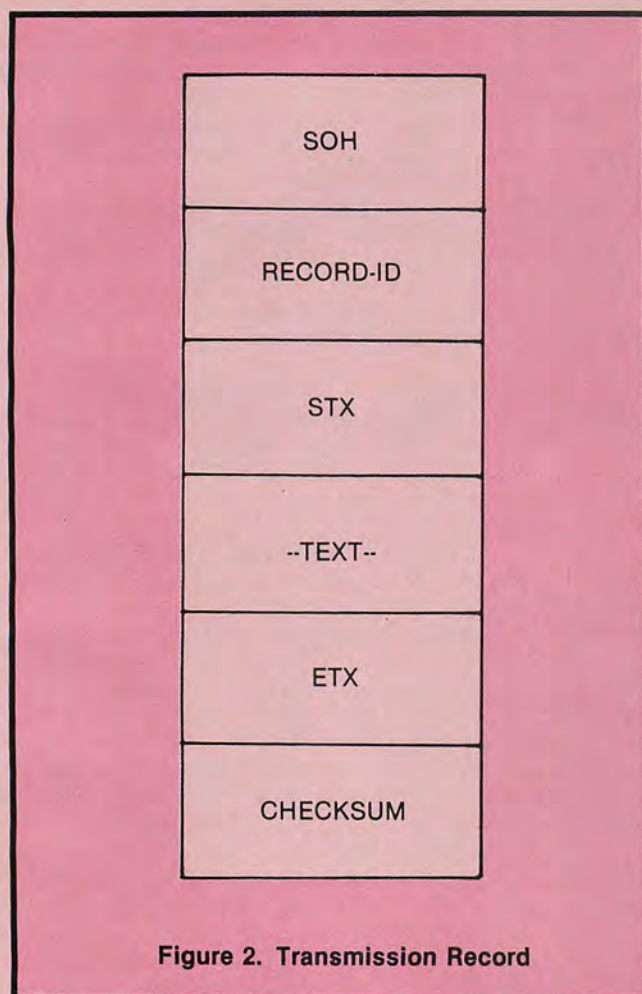


Figure 1. Transmitted Data File



Unlike a text record, which can be variable in length, the Header and Trailer records are fixed length 128 byte records which always contain the following fields:



Each of these fields are required and must be present in the record format. If a field must be "omitted", its value must be set to spaces (HEX '20'). Each field is defined in detail in the following descriptions. The contents of these fields are very important, and the field definitions must be exactly adhered to; otherwise severe incompatibilities could result, making it impossible for others to use your transmission file.

#### IDENTIFICATION CONSTANT — 5 Characters

“.HDR1” HEADER RECORD

“.EOF1” TRAILER RECORD

THE “.” IN THE EXAMPLES REPRESENTS A “RS” CHARACTER (HEX “1E”)

The Identification Constant field identifies the record as either the Header record (HDR1) or as the Trailer record (EOF1). The first character of the identification constant is a RS character (HEX ‘1E’). (All IAPS control records have a RS character as the first character in the text section of the record.)

#### FILE FORMAT — 1 Character

“@” PURE BINARY

“A” ASCII

“B” ASCII — COMPRESSED CHARACTERS

“C” ASCII — COMPRESSED KEYWORDS

“D” TO “Z” RESERVED

“0” TO “9” PRIVATE FORMATS

The File Format identifies the IAPS format used to generate the transmission file. The file formats supported under IAPS are:

#### Pure Binary

The Pure Binary is not recommended for general use, as device incompatibilities will probably occur. The binary file type has been provided, however, to support those instances in which it is necessary to transmit large volumes of data containing “control characters” and where the “Control Character Translation” feature of IAPS would cause an excessive increase in the file size. See the “Control Character Translation” specifications in the description of the text record for more information. Specifications for a Binary file can be found in the section Binary Files.

#### ASCII Files

Most files transmitted in IAPS format will be ASCII type files containing either source code or data files. File Type “A” (ASCII) files will not be compressed for transmission efficiencies.

#### ASCII — Compressed Character Files

File Type “B” (compressed character) files can provide a reduced file transmit time (and size) by reducing repeated characters to a single character and a repetition count. See the description “Character Compression” under text records for more information.

#### ASCII — Compressed Keyword Files

File Type “C” (compressed keywords) provides for translation of keywords (such as BASIC’s “PRINT”, “GOTO”, etc.) into a condensed format for transmission. Any file identified as “ASCII — COMPRESSED KEYWORD” may also contain compressed character data sequences. Additional information may be found under the section titled “Text Records”.

#### FILE TYPE — 1 Character

“D” DATA

“S” SOURCE

“A” ABSOLUTE CORE IMAGE

“R” RELOCATABLE CORE IMAGE

The File Type field identifies in general terms the contents of the file.

File Type “D” and “S” are normally used with File Format “A”, “B”, and “C” (ASCII type files).

File Type “A” and “R” are normally used with binary files.

File Type “S” will cause any ASCII file to take on a slightly different format. If the file is an ASCII source file, then each record in the file is assumed to have a carriage return as the last character in each line. The output translation provided by the receiving site must re-insert the carriage return.

All IAPS format transmission files created without Header and Trailer records are assumed to “ASCII Source” files. (The original version of IAPS did not provide for a Header and Trailer record which is now required for all files.)

#### MAXIMUM RECORDSIZE — 5 Characters

The Maximum Recordsize is a number up to 2048 that indicates the maximum record length, in bytes.

#### RECORD COUNT — 8 Characters

The Record Count field is used as part of the error recovery procedures. Under the IAPS format all records



are assigned a sequential numerical id. This record id starts with 0 for the file header record and is incremented by 1 for each record transmitted. The record count field in the trailer record will contain the record id of the last record transmitted.

The record count field is required on the file Trailer record. The record field is optional on the file Header record and maybe specified as spaces. It is desirable, however, that this field also be supplied in the Header record when possible. This is because some computer systems require knowledge of the maximum file size before file creation.

#### FILE NAME — 17 Characters

The File Name field contains the rightmost 17 bytes of the file name. If the file name is less than 17 bytes, it is left-justified and the remainder of this field is padded with blanks.

#### GENERATION NUMBER — 4 Characters

This field contains a number from 0001 to 9999 indicating the absolute generation number (the first generation is recorded as 0001).

#### VERSION NUMBER — 2 Characters

This field contains a number from 00 to 99 indicating the version number of the generation number (the first version is recorded as 00).

#### CREATION DATE — 6 Characters

Year, Month, and Day when the file was created. The date is shown in the format YYMMDD where:

yy = Year (00-99)  
mm = Month (01-12)  
dd = Day (01-31)

#### AUTHOR'S NAME — 30 Characters

The 30 characters of the Author's Name field can be used to identify the author. This can be a corporate name, an individual's name, a group of names, or some other means of identifying the author.

This field should not be confused with the name of the copyright owner, which could be different.

#### COPYRIGHT OWNER — 30 Characters

The 30 characters of the Copyright Owner's Name field can be used to identify the owner of the copyright. Like the author name field, this field can be a corporate name, an individual's name, or some other means of identifying the owner of the copyright.

#### COPYRIGHT YEAR — 4 Characters

This field contains the date of the latest copyright issued for the contents of this transmission file. The date is shown in the form YYYY where YYYY is the full Gregorian date as in '1974'.

### DETAILED TRANSMISSION RECORD FORMAT

All three transmission record formats (Header, Data, Trailer) have the same basic format. All rules regarding the use of control characters must be followed in all records, including all control records, such as the header and trailer records.

#### START-OF-HEADER CHARACTER (HEX '01')

The Start-of-Header character identifies the start of a transmission record. The Checksum is reset to zero

when a SOH character is detected. The checksum accumulation starts, therefore, with the character that follows the SOH character. Any character that occurs after the Checksum characters and prior to a SOH should be ignored unless it was an EOT character.

#### RECORD-ID

The Record-ID is a one to eight digit number used to identify each individual transmission block. The Record-ID number is transmitted as an ASCII character string with leading order zero suppressed. Record "00000000"

IDENTIFICATION CONSTANT	5 CHARACTERS
FILE FORMAT	1 CHARACTER
FILE TYPE	1 CHARACTER
MAXIMUM RECORDSIZE	5 CHARACTERS
RECORD COUNT	8 CHARACTERS
FILE NAME	17 CHARACTERS
GENERATION NUMBER	4 CHARACTERS
VERSION NUMBER	2 CHARACTERS
CREATION DATE	6 CHARACTERS
EXPIRAT DATE	6 CHARACTERS
AUTHOR'S NAME	30 CHARACTERS
COPYRIGHT OWNER	30 CHARACTERS
COPYRIGHT YEAR	4 CHARACTERS
--RESERVED--	9 CHARACTERS
TOTAL	128 CHARACTERS

Table 1. Header and Trailer Record Format

is transmitted as "0". This number is used primarily for error control to insure that a transmission record is not inadvertently dropped. The record-id is also used to request re-transmission of the record when a checksum error is detected.

Data records will normally start with a record-id of 1, as record 0 is reserved for identification of the transmission header and trailer record. Under certain conditions, such as the transmission of keyword encoded files, the actual data records might start with a record-id greater than 1. See the section on "Keyword Encoding" for a more detailed description.

#### STX

#### START-OF-TEXT CHARACTER (HEX '02')

The STX character is used to define the start of the text portion of the transmission record.

#### TEXT PORTION OF THE RECORD

The Text Portion of the Record contains the "user-defined" text, which will not contain any control charac-



ters other than those defined by IAPS. The IAPS defined control characters are:

DLE (HEX '10') Control Character Translation  
ESC (HEX '1B') Character Compression  
SUB (HEX '1A') Keyword Encoding  
RS (HEX '1E') identifies the record as a control record.

### Control Character Translation

The DLE (HEX '10') is used as a control signal to indicate that the original text contained a control character. Control characters, other than DLE, SUB, ESC and RS are not allowed in the text, because of the possibility of interfering with the control of the IAPS data format.

The possibility of interference with the operation of the I/O devices being used must also be considered. For instance, most paper or magnetic tape handlers will respond to the four device control characters: DC1, DC2, DC3, DC4 (Reader on, Punch on, Reader off, Punch off). Many terminals and modems will also respond to an EOT (HEX '04') — it shuts them off!

For these reasons, all characters that fall in the range of HEX '00' through '3F' and HEX '80' through '9F' will be translated to a two-byte sequence. The first byte will always be a DLE character. The value of the second byte will depend on the value of the original un-translated byte.

If the original byte was in the range of HEX '00' through HEX '3F', then it will be translated into the range of HEX '40' through HEX '5F'. This translation is done by either OR'ing the original character and a HEX '40', or by simply adding a HEX '40' to the original character.

If, however, the original character was in the range of HEX '80' through HEX '9F' (control character with the parity bit [8th bit] set), then it will be translated into the range of HEX '60' through '7F'. This is done by subtracting a HEX '20' from the original byte. The translating can also be accomplished by AND'ing the original character with a HEX '3F' and then OR'ing the result with a HEX '60'.

### Character Compression

The EXC (HEX '1B') is used for compression of repeated characters. Under IAPS a continuous string of 4 to 98 repeated characters can be compressed into a three character sequence.

This format has been made optional, however, because in some systems, due to the hardware architecture or the programming language that are available, examination of the input data to check for character repetition can become a non-trivial task.

The ESC character (HEX '1B') is used to identify a compression sequence. A compression sequence consists of three characters.

The first character in the sequence is the ESC character.

The second character in the sequence is the repetition count. The value of the repetition count is a single character in the range of HEX '20' to '7E', representing a count of 4 to 98.

The third character in compression sequence is the actual "compressed" character. The "compressed" character could be a DLE sequence if it was originally a control character. The "compressed" character could also be a SUB sequence if the compressed character were actually a keyword. See the section on Keyword Encoding for additional information.

### Examples:

(The spaces are shown in the following examples to improve the readability of the examples, and would not actually be present in a real situation.)

### Example 1:

a b c d d d d d d d d d e f g (16 characters)

after conversion to IAPS would become:

a b c ESC & d e f g (9 characters)

The character "&" is a HEX '26' which indicates that there were 10 characters in the original input.

(HEX '26' - HEX '20' = HEX '06')

(HEX '06' + HEX '04' = HEX '0A')

(HEX '0A' = decimal 10)

(The Compression rule states that a HEX '20' represents a compression value of 4; therefore the HEX '26' represents a compression value of 10.)

The character compression technique reduced the file size by 7 characters in this example.

### Example 2:

a b c d e f CR CR CR CR CR CR CR CR CR

would create the compressed output:

a b c d e f ESC \$ DLE M

(DLE M is the control character translation for a carriage return (CR) and the "\$" has a HEX value of '24'.  $24 - 20 + 4 = 8$ , the number of carriage returns in the original input.)

### Keyword Encoding

The SUB (HEX '1A'), character is used as a control signal to indicate that the original text contained data which has been compressed into a keyword compression sequence.

Each keyword compression sequence can encode 1 to 255 characters into a two-byte sequence. IAPS can handle a maximum of 94 different keyword compression sequences. (94 different keywords can be encoded, each, of course, may be used as many times as necessary.)

A Keyword Compression sequence is always a two character sequence. The first character is always a SUB (HEX '1A'). The second character is a table search argument (lookup value), and has a value of HEX '20' through '7E', which allows the maximum of 94 keyword compression sequences.

The first keyword encoded would be assigned a table lookup value of a HEX '20', the second would be assigned a HEX '21', and so forth. The 94th keyword would be assigned a HEX '7E', which is the highest value allowed.

The table of keyword constants is transmitted as part of the transmission file, prior to any data that has been keyword compressed. The transmission of the table is accomplished using the "KEYT" and "KEYE" control records.

The first byte in either of these control records will always be a RS character (HEX '1E'). The second through



fifth characters will be "KEYT" (keyword text). The last keyword text control record will contain "KEYE" (keyword end) as the second through fifth bytes.

Each keyword control record may have multiple keyword definitions, but the complete textual value for a keyword must be contained on a single control record. (Spanned definitions across two control records is not permitted.)

Each keyword definition has three parts: the length of the text, the table lookup value, and the actual text constant.

The text length is a 2 byte field, representing a text length of 1 to 255 bytes. The binary length (which can be represented in a single 8-bit value) is separated into two 4-bit nybbles. Each nybble is then OR'ed with a HEX '40', resulting in a byte in a range of HEX '40' through '4F'. The same process is then done with the second nybble, resulting in the 2-byte length. The two bytes are then output as the "length bytes".

The length specified must be the length of the text constant only, including any DLE, SUB or ESC sequences.

If you were looking at the "KEYT" or "KEYE" record in memory, then the length of the first text constant could be added to the address of the first text byte in that entry. The resulting address would then point to the first of the two length bytes for the next entry or to the ETX at the end of the control record.

The table lookup value is a single byte having a value of HEX '20' through '7E'.

The text constant is a character string of 1 to 255 bytes in length, and may contain Control Character Translation, Character Compression, or Keyword Compression sequences.

**WARNING:** Do not define a keyword sequence which becomes recursive, i.e. do not define keyword sequence "A" which includes keyword sequence "B", if keyword sequence "B" also includes sequence "A". If nested definitions are being used, this can create some difficulty in following this rule. For instance, sequence "B" could include sequence "A" and "F", sequence "D" could include "E", "E" could contain "B". If sequence "A" were then defined to contain "D", a recursive sequence of B-A-D-E-B-A-D-E-B... will have been defined.

#### "RS" CHARACTER (HEX '2E')

The "RS" character is used to identify control records. If the first character in the text section is a "RS"

character then the record is to be treated as an IAPS control record. The next four characters after the RS will identify the control record:

"HDR1"	header record
"EOF1"	trailer record
"RMKS"	remarks record
"KEYT"	keyword text record
"KEYE"	last keyword text record

The Header (HDR1) and Trailer (EOF1) records have been defined in the section titled "Header and Trailer Records".

The keyword records (KEYT and KEYE) were defined in the section Keyword Compression.

The remarks record (RMKS) causes the contents of the record to be displayed during the loading process. The record will not be passed through to the output unless the output is also an IAPS file.

If any other record identification is encountered, it will be treated as a remarks record. This will assist in providing a form of downward compatibility, making it possible for an older version of an IAPS conversion program to process a transmission file produced by a more recent and up-to-date version of IAPS.

As necessary, additional control records will be added to IAPS. Any extensions made to IAPS should be cleared by the standardization group prior to the change actually being incorporated into a conversion program.

#### ETX

#### END-OF-TEXT CHARACTER (HEX '03')

The ETX character marks the end of the Text Record and is also used as an indicator that the next four characters are to be used as the Checksum characters.

#### CHECKSUM

The Checksum is a simple 16-bit addition of all characters after the SOH, up to and including the ETX. The actual total is a 16-bit value, ignoring any overflow that might occur. The Checksum characters are created by first producing the twos-complement of the checksum, and then separating the 16-bit value into four nybbles (a nybble is a 4-bit "1/2 byte"). Each nybble is then OR'ed with a HEX '40' to create a byte whose value is in the HEX '40' to '4F' range. □

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\*Some of these advantages require extra-cost options.



# BUSINESS EDITORIAL

By Jim Schreier

SSI  
The Schreier Software Index

## SOFTWARE OBSERVATIONS

Something exciting happened by late winter of 1978. Microcomputing changed directions; microcomputers began disassociating themselves from the hobbyist connotation. In 1977 the industry launched the home oriented personal computer. PET™ and the TRS-80™ dawned to an interested and inquisitive public. Hobbyist and personal computing now seemed to be separate from micro business computing.

This may sound confusing. Exact terms may be lacking, but three elements are emerging: the microcomputer hobbyists, personal microcomputer and micro business. Few people fail to see the hand in glove relationship between the hardware and the software. Yet, it is still difficult to provide software when the industry fluxes day by day.

Comparing the hardware to the software is like comparing Dr. Jeckle to Mr. Hyde. An example may be of interest. A few months ago a gentleman from Alabama contacted me for a little software guidance. He explained he had just purchased a TRS-80 with 32K of RAM and all the extras. Now, where do you go to find the TRS-80 business applications?

Except for a few Tandy supported TRS-80 programs, there are no business applications now available. I felt a deep disappointment having to be the one to explain the microcomputer facts of life to this hopeful gentleman.

What went wrong? A personal computer was purchased to do a micro business job. At this time the TRS-80 is designed for a very small business or the home. All the TRS-80 software is home oriented. Most microcomputer systems today have this exact or similar software problems.

Why not write your own business applications? Any person who owns

a soldering iron, a CPU chip and writes his own programs is a "hobbyist". And hobbyists, for some reason, are now considered pioneers and out of step with the industry today. The only way to write your own business applications is to sit down and by trial and error teach yourself through examples published in books and magazines. With luck this process takes 6 to 12 months. This is the *raison d'être* behind pre-packaged, ready to go software.

What is available in the pre-packaged format? Other than the standard blackjack, biorhythms and Star Treks, a start has occurred. Games may still be in the heart of the hobbyists and personal computing areas, but valuable inroads have been constructed to the micro business systems. If the gentleman from Alabama had purchased a North Star system, for example, he would have found a micro-cornucopia of business software, pre-packaged and ready to run.

## The time has come for... software sources to consider joining hands.

Although there are few if any hardware differences between hobbyists, personal and business microcomputers, the software is very different.

Based on what is happening today, most microcomputer brand names are in the process of being stereotyped. Brand name "X" will carry the "hobbyists" label because their boards never seem to work or they only come as kits. Brand name "Y" will become known as a "personal" computer, great for home fun and games. However, if brand name "X" now begins to focus on business applications and the business community, the "hobbyist" image may be changed. The key is, of course, available software for specific systems.

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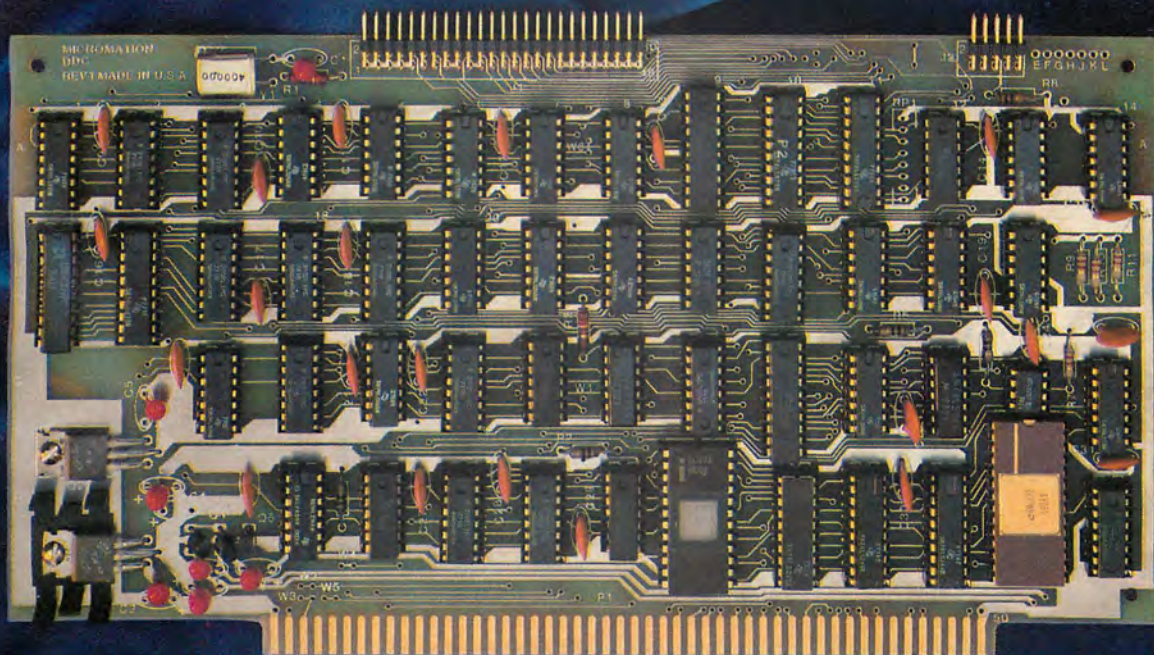
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This system requires an Alpha Micro computer system, minimum of 48k of memory, CRT, printer and dual floppy disk drive.

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DEALER INQUIRIES INVITED

There are thousands of microcomputer software programs available in a multitude of formats. There are listings in books, pamphlets, magazines, on disk, tape (cassette and paper), on Floppy ROMs™ and various newsletters. The microcomputer software literature has more than doubled in the last 10 months. It should double again by Spring, 1979. Games, as helpful and fun as they are, have peaked. New directions are appearing. Basic training in Spanish and French, helpful homemaker programs and even sophisticated household budget programs are examples.

The time has come when some of the 200 plus software sources consider joining hands. It seems to be a fact of life that few of these many suppliers can afford writing quality programs on the ten most common microcomputer systems in order to produce functional and diversified software. For example, let's say Mr. Smith has written an excellent income/expense ledger. It can be used in his business or in his home. It may be altered to meet a number of circumstances. To make such a program available would require:

1. Listings for all major 6502/6800/8080/Z-80 based systems in at least one common version of BASIC for each system; and/or
2. Cassette tape in the Kansas City, Tarbell, etc. standard with disk options.

Each program would need to state memory requirements. This could change the average microcomputer store into chaos matched only by the sizes and styles of a shoe store. And would distribution be possible?

This leads to another observation. Now all the potential seems to be in the hardware. Software must become eclectic. If it fails to meet this challenge, hardware will continue to advance unchecked, outdating what software has been written. The current lack of Z-80 software is an example.

The marketplace should, in time, bring hardware/software into balance. Right now there is very little balance. Some magnificent software exists. You should be demanding that this software be made available for your system. Any person purchasing a specific microcomputer system for personal or business use should make sure that the software does exist. Overlooking this step may be cause for having to buy a cheap soldering iron and reverting back to that ancient group called "microcomputer hobbyists." □

This page is reserved for any company editorial geared to the small business market. Please send your editorial directly to Carl Warren, Senior Editor, INTERFACE AGE Magazine, P.O. Box 1234, Cerritos, California 90701.

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Manuscripts should be double-spaced, typewritten pages, one inch margins, and not less than 3½ pages in length (one published page). Pages should be numbered to insure correct text. Photographs should be numbered and labeled on the backside with a description. Photos should be taken with uniform lighting and background, in the form of glossy black and white prints. Tables, listings, etc., shall be on separate sheets. Computer listings shall be printed using a new ribbon to assure darkest print copy. Authors shall supply a statement of their background, expertise and level of accomplishment.

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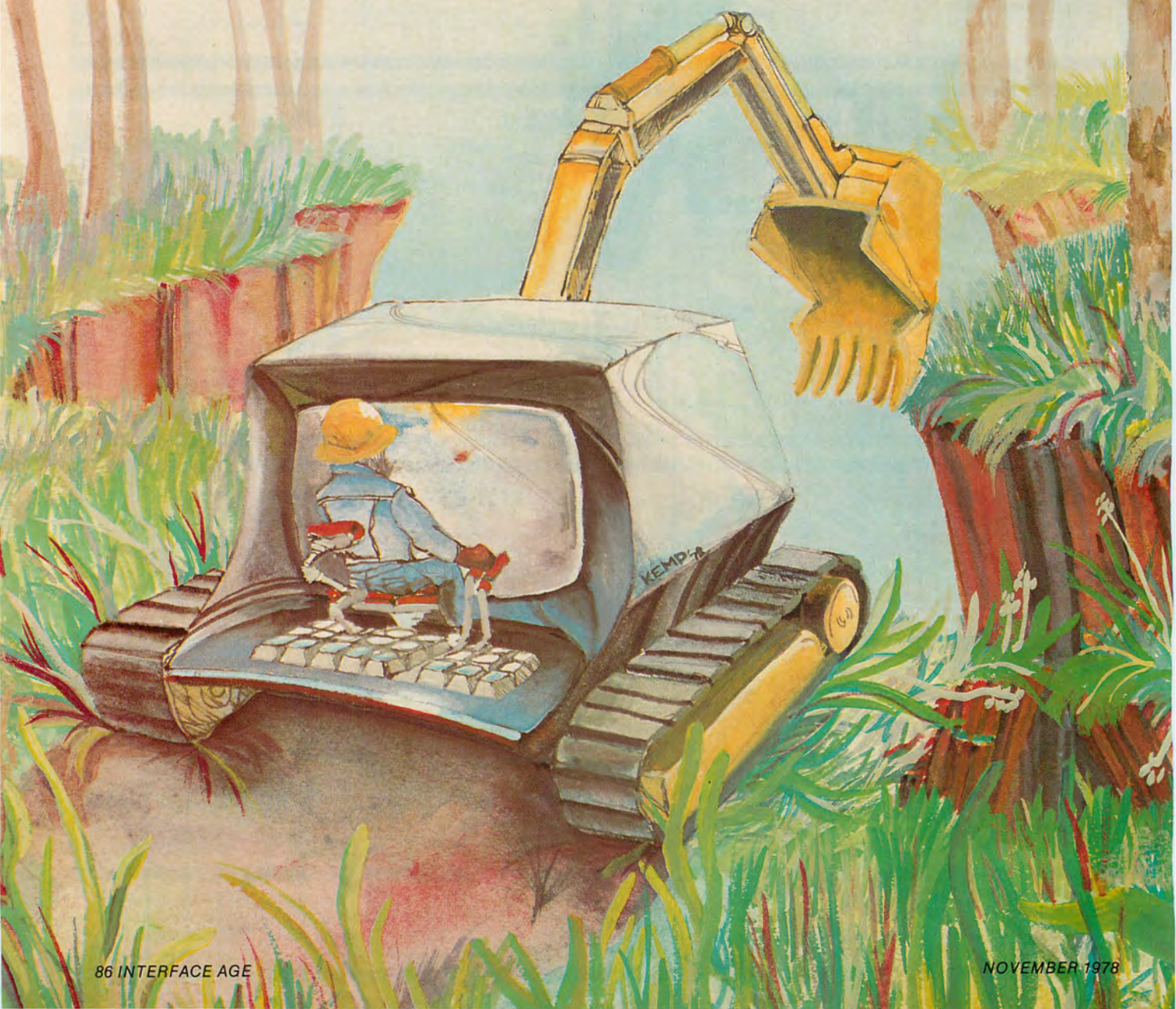
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CIRCLE INQUIRY NO. 75



# BUILDING AND LAND DEVELOPMENT PROGRAM

BY: W.S. CHELLBERG





Have you ever struggled with a long and difficult problem and then suddenly the light dawned — 'Do it on the computer'? That's exactly what happened to me. In my case it was an Altair 8800-B with 48K, an ADM-3 CRT, a MITS cassette, and a Selectric Type-Away interface by Micromation, Inc., all using 4.0 BASIC.

I was struggling with the problem of developing a tract of land, and my 'Phase I' plan was to build an office/service type of building. I wanted to know if it was feasible and profitable in the surrounding market. So I designed a program in which I could change any of the limiting factors (e.g., rent in \$ per sq. ft., expected expenses, mortgage cost, etc.).

It is very important for a developer to be able to set rental rates that are realistic compared to the marketplace, and to know the return on his investment (cap rate) and the annual cash flow of the development. In the past this consumed vast amounts of paper and pencils, and now the CRT takes the beating until I get what I want. Then I print it out. I had to write my own software on the Selectric interface. Consequently the program will not have a printer section. You will have to write your own if you have a printer.

### PROGRAM DETAILS

The variables that you will be asked to answer are all shown in Figure 1. Some of them are facts that you have already decided upon. You may be planning to purchase the land, so you will have a good idea of the value of it. However, in the present market remember that your land is appreciating every day. Perhaps you have already contacted several contractors for bids. If not, you should at least get some rough estimate of the dollars per square foot it will cost to build the type of building in mind. This program asks for a total dollars figure for the building, so multiply it out.

### LIST OF INPUT QUESTIONS

YOUR PROJECT NAME	AS
DATE	DS
COST OF LAND OCCUPIED BY PROJECT	L
ESTIMATED COST OF BUILDING	C
TOTAL SQ. FT. OF BUILDING	F
NUMBER OF RENTAL UNITS	R
SQ.FT. OFFICE PER UNIT	O(I)
DOLLARS PER SQ.FT. OF OFFICE	D(I)
SQ.FT. WAREHOUSE PER UNIT	W(I)
DOLLARS PER SQ.FT. OF WAREHOUSE	E(I)
PROJECTED ANNUAL EXPENSES	
VACANCY PERCENT	V
MANAGEMENT PERCENT	M1
INSURANCE \$/SQ.FT.	IN
TAXES \$/SQ.FT.	T
MAINTENANCE \$/SQ.FT.	M2
EXPECTED INTEREST ON MORTGAGE	IR
LENGTH OF MORTGAGE IN MONTHS	MO

Figure 1.

### SAMPLE RUN

#### HOMESTEAD FEASIBILITY STUDY

UNIT NO.	OFFICE	\$	WAREHOUSE	\$	TOTAL SQ. FT.	AVG. \$	TOTAL ANNUAL
1.	8400	6.25	9600	2.50	18000	4.25	76500.00
2.	1200	6.25	4800	2.50	6000	3.25	19500.00
3.	1200	6.25	0	0	1200	6.25	7500.00
4.	360	6.25	3240	2.50	3600	2.88	10350.00
11160 (38%)			17640		28800		\$113850.00

Hit return for more?

Vacancy	5%	5692.50
Management	5%	5692.50
Insurance	\$.10/Sq. Ft.	2880.00
Taxes	\$.52/Sq. Ft.	14976.00
Maintenance	\$.05/Sq. Ft.	1440.00
TOTAL PROJECTED EXPENSES		\$ 30681.00

Hit return for more?

NET OPERATING INCOME	\$ 83169.00
MORTGAGE REPAYMENT (Monthly = \$5268.10)	63211.00
ANNUAL CASH FLOW	\$ 19951.00
CAP. RATE 16%	
MAXIMUM FINANCING	
Income Approach	\$615155.00
Fair Market Value Approach	\$456750.00



## LISTING

```

10 CLEAR 2000
15 REM BY W.S. CHELLBERG, JUNE 1978, FOR INTERFACE AGE.
20 PRINTCHR$(26):REM CLEAR SCREEN
30 INPUT"WHAT IS THE PROJECT NAME";A$
40 PRINTCHR$(26)
50 PRINTTAB(20)"** ";A$" FEASABILITY STUDY ***"
60 FOR I = 1 TO 7: PRINT:NEXT I
70 INPUT"DATE ";D$
80 INPUT"COST OF LAND THAT BUILDING WILL OCCUPY (NO EXTRA VACANT
LAND)";L
90 INPUT"ESTIMATED COST OF BUILDING ";C
100 INPUT"TOTAL SQUARE FEET OF BUILDING ";F
110 INPUT"NUMBER OF RENTAL UNITS ";R
120 TT=0:WT=0:OT=0:AO=0:AT=0
130 FOR I=1 TO R
140 PRINT:PRINT"UNIT # ";I;:INPUT" SQ.FT. OF OFFICE = ";O(I)
150 OT=OT+O(I):REM OT=TOTAL OFFICE SQ.FT.
160 INPUT" DOLLARS PER SQ.FT. = ";D(I)
170 PRINT:INPUT" SQ.FT. OF WAREHOUSE = ";W(I)
180 WT=WT+W(I):REM WT=TOTAL WAREHOUSE SQ.FT.
190 INPUT" DOLLARS PER SQ.FT. = ";E(I)
200 AO(I)=(O(I)*D(I))+(W(I)*E(I)):REM AO(I)=TENANT TOTAL ANNUAL
CONTRIBUTION
210 AT=AO(I)+AT:REM AT=GROSS ANNUAL INCOME
220 NEXT I
230 TT=OT+WT:REM TT=TOTAL SQ.FT.
240 IF TT<>F THEN 250 ELSE 260
250 PRINT:PRINT"*** WRONG SQUARE FEET - DO IT OVER ! ***":PRINT:PRINT:
GOTO120
260 PRINT:PRINT:PRINTTAB(20)"ENTER PROJECTED ANNUAL EXPENSES":PRINT
270 INPUT" VACANCY % ";V
280 INPUT" MANAGEMENT % ";M1
290 INPUT" INSURANCE $ PER SQ.FT. ";IN
300 INPUT" TAXES $ PER SQ.FT. ";T
310 INPUT" MAINTENANCE $ PER SQ.FT. ";M2
320 INPUT"EXPECTED INTEREST ON MORTGAGE (EXAMPLE: 9.25)";IR
330 INPUT"TERM OF MORTGAGE (IN MONTHS)";MO
335 REM -- BEGIN COMPUTATION SECTION --
337 REM COMPUTE MAX. FINANCING VIA INCOME APPROACH
340 V1=AT*(V/100):REM V1=VACANCY IN $
350 M3=AT*(M1/100):REM M3=MANAGEMENT $
360 IM=IN*F:REM IM=INSURANCE $
370 TA=T*F:REM TA=TOTAL REAL ESTATE TAXES
380 M4=M2*F:REM M4=MAINTENANCE $
390 AS=AT-(M3+M4+TA+IM+V1):REM AS=NET OPER. INCOME
400 NO=M3+M4+TA+IM+V1:REM NO=TOTAL EXPENSES
410 TV=(AS/1.3)/.104:REM TV=MAX. FINAN.VIA INCOME APPROACH
415 REM COMPUTE MAX. FINANCING VIA F.M.V APPROACH
420 IF C=0 THEN 400
430 S1=(L+C)*.75:REM S1= MAX. FINAN. VIA F.M.V APPROACH
435 REM COMPUTE ANNUAL CASH FLOW
440 IR=IR/1200
450 Q1=(1+IR)^MO
460 PM=TV*((IR*Q1)/(Q1-1)):REM PM=MONTHLY PAYMENT
470 PY=PM*12:REM PY=ANNUAL MORTGAGE REPAYMENT
480 CR=AS/C:CR=INT(CR*100):REM CR=CAP. RATE
490 OP=OT/F:OP=INT(OP*100):REM OP=% OF OFFICE
500 FOR I=1 TO R
510 F(I)=O(I)+W(I):REM F(I)=TOTAL SQ.FT. PER TENANT
520 DS(I)=AO(I)/F(I):REM DS(I)=TENANT AVG. RENTAL
530 NEXT I
540 P=AS-PY:REM P=ANNUAL CASH FLOW
545 REM BEGIN READ-OUT
610 PRINTCHR$(26)
620 PRINTTAB(20)"** ";A$" FEASABILITY STUDY ***":PRINT
630 PRINTTAB(45)D$:PRINT
640 T$=" ## ##### ##.## ##### ##.## #####
##.## $$$$$$.##"
650 PRINT"UNIT OFFICE $ WAREHSE $ TOTAL
AVG. $ TOTAL"
660 PRINT" NO. SQ.FT. ANNUAL"
670 PRINT"-----":PRINT
680 FOR I=1 TO R
690 PRINTUSING T$;I,O(I),D(I),W(I),E(I),O(I)+W(I),DS(I),AO(I)
700 PRINT
710 NEXT I
720 PRINT"-----"
730 S$=" ##### (## %) #####"
$$$$$.##"
740 PRINTUSING$;OT,OP,WT,OT+WT,AT
750 INPUT"HIT RETURN FOR MORE";ZZ
760 R$="$$$$$.##"
770 PRINT:PRINT:PRINTTAB(10)"VACANCY ";V"% = ";:PRINTUSINGR$;V1
780 PRINTTAB(10)"MANAGEMENT ";M1"% = ";:PRINTUSINGR$;M3
790 PRINTTAB(10)"INSURANCE $ ";IN"/SQ.FT. = ";:PRINTUSINGR$;IM
800 PRINTTAB(10)"TAXES $ ";T"/SQ.FT. = ";:PRINTUSINGR$;TA
810 PRINTTAB(10)"MAINTENANCE $ ";M2"/SQ.FT. = ";:PRINTUSINGR$;M4
820 PRINT"-----"
830 PRINT"TOTAL EXPENSES ";:PRINTUSINGR$;NO
840 INPUT"HIT RETURN FOR MORE";ZZ
850 PRINT:PRINT:PRINT"NET OPERATING INCOME";:PRINTUSINGR$;AS
860 PRINT:PRINTUSING"mortgage repayment (MONTHLY = #####.##)
$$$$$.##";PM,PY
870 PRINT"-----"
880 PRINTUSING"ANNUAL CASH FLOW $$$$$$.##";P
890 PRINT:PRINT:PRINTUSING"CAP RATE ## %";CR
900 PRINT:PRINT:PRINTUSING"MAXIMUM FINANCING BY INCOME APPROACH
$$$$$.##";TV
910 PRINT:PRINTUSING" FAIR MARKET VALUE
APPROACH $$$$$$.##";S1
920 INPUT"WANT TO SEE IT AGAIN (Y OR N)";Z$
930 IF Z$="Y" THEN 940 ELSE 950
940 PRINTCHR$(26):GOTO545
950 CLEAR250:PRINTTAB(30)"THANK YOU !":PRINT:PRINT:PRINT:PRINT
960 END

```



The most interesting use of this feasibility study is the way the rent structure can be varied to produce financing. Creating a project that will produce a substantial cash flow and yet be competitive is a real challenge, but it is very rewarding in terms of dollars and a sense of accomplishment.

Most of the questions you are asked are simple, such as building size. Most municipalities have laws of 'set-back' so you are immediately limited at least to that. Then there is parking, water retention, truck traffic, etc. When all this is taken into account, the remainder is for your building.

The number of rental units is variable, and you may want to try it several ways to find the maximum profitability. The expense figures are rather standard. Most lenders require certain percentages (for their own protection), especially on vacancy and management. I have found that most lenders want from 4 to 7% on vacancy, depending on the development, and from 3 to 5% on management. The best thing to do is contact a potential lender and find out what they may want on your type of project.

The program really needs no explanation as it is quite simple. I have included 'REMs' so that if you want to do any changing, it will be quite easy (when you enter the program leave the 'REMs' out). You will notice in the read-out section I have interspersed several 'input' statements with a 'zz' argument. These give you time to read before going on to the next few lines. Throughout the read-out section I have used 'PRINTUSING' statements which do a beautiful job of structuring, but some BASICS do not have this feature, so you will need to round off the integers and etc. for the structure of your read-out.

I hope you will enjoy the ease of doing your figuring with the 'electronic scratch pad', and if you are thinking of doing some development work, this may give you some new ideas and aid in your calculations. □

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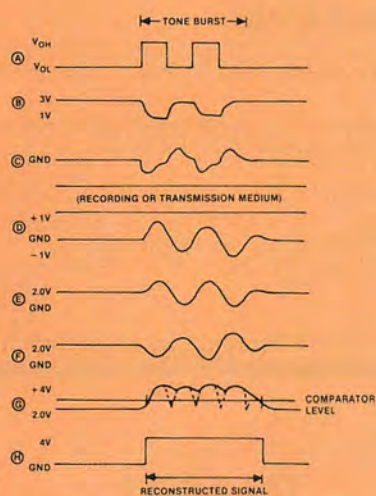


# Interface An MPU to a Cassette Tape Recorder

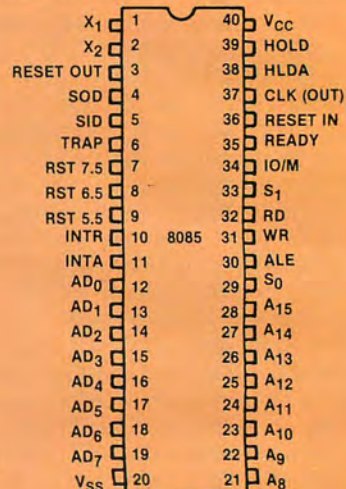
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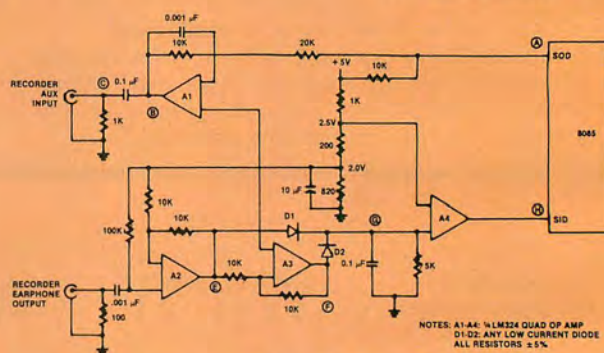
### Figure 1. Tape Interface Data Recording Scheme



### Figure 4. Analog Signal Waveforms



### Figure 2. 8085 Pinout Diagram



### Figure 3. One Chip Magnetic Tape Interface Schematic

One of the most vexing problems of the engineer has always been the marriage of design objective and cost constraints; this is nowhere more apparent than in the interface of a microprocessor unit with a cassette tape recorder. Ideally, the least expensive recorder available would be utilized, but relatively narrow bandwidth, high noise, and inconsistent tape speed often make the cheap cassette recorder unsuitable for traditional data transmission methods like FSK.

A solution to this cost/design dilemma is to use a microprocessor chip with direct serial I/O capability such as the Intel 8085, together with a program in which the length of a signal, and not its frequency, is used to distinguish the bits of data.

Figure 1 illustrates how data is transmitted by the 8085. Each bit consists of a tone burst followed by a pause. The first third of each bit period is always a tone burst, while the final third of the period is always a pause (i.e., no tone). The middle third is either a tone burst to transmit a logical "one" or a pause corresponding to a "zero". In other words, the burst/pause ratio is varied to distinguish between ones and zeros.

The tone burst signal is produced at pin 4 of the microprocessor unit shown in Figure 2. While the 8085 is 100% software compatible with the popular 8080A MPU, the addition of the SOD (Serial Output Data) and

SID (Serial Input Data) lines gives the new chip a direct data link to the outside world; this serial I/O capability is supported within the 8085 by two new instructions, RIM (Read Interrupt Mask) and SIM (Set Interrupt Mask).

RIM is used to read the current status of the three interrupt masks into the accumulator, while additional bits are set to show what interrupts (if any) are pending as well as the logical state of the SID input (pin 5). The complement of RIM is SIM, which has a dual function depending on the current contents of the accumulator. If bit 3 or 4 of the accumulator is a logical one, SIM can be used to change the three interrupt masks; if bit 6 is a one, SIM can set the SOD output (pin 4). These two functions of the SIM instruction operate independently.

A suggested interface circuit between a cassette tape recorder and the 8085 is shown in Figure 3. The circuit uses one LM324 quad op amp and a few standard-value discrete components which should be available in even a digital design laboratory. The waveforms present at several points in the circuit are illustrated in Figure 4.

Because the deviations from ground of the tone bursts on the SOD line are all positive, the signal must be conditioned to eliminate its DC component before application to the capacitive auxiliary input of the recorder. The tone burst signal on the SOD line is inverted and buffered by op amp A1 and its attendant circuitry. A high-



pass RC filter then forms a crude sine wave for input to the recorder.

On playback, analog circuitry is again used to detect the presence of a tone burst. Output from the recorder earphone jack is buffered by op amp A2 and then inverted by A3. The peaks of the signals from A2 and A3 are transmitted through diodes D1 and D2, respectively, and then filtered by an RC network. Comparator A4 squares up and amplifies the resulting waveform, producing the logic signal that is applied to the SID line. Since the op amps are powered by a single 5-volt supply, the 2.0-volt reference level is obtained from a resistive voltage divider.

## SOFTWARE

The algorithm used by the 8085 for reading a data bit off the tape is simple and straightforward. If the tone duration is longer than the pause, the bit is a one; otherwise, it is a zero. Since only the time ratio is considered, variation in the tape speed will not affect the data determination.

Two subroutines, TAPEO and TAPEIN, are used in the cassette recorder interface scheme. TAPEO is used to output the contents of register C from the MPU to the recorder, while TAPEIN reads 8 bits from the recorder into register C.

### OUTPUT ROUTINE

When called, subroutine TAPEO in turn calls another subroutine, BURST, three times for each bit. If A<sub>6</sub> (the SOD enable bit) is set when BURST is called, a square-wave tone burst is transmitted. If A<sub>6</sub> is not set, BURST simply delays for an equivalent amount of time before returning, producing a space in the output.

The three subroutine calls to BURST are used to, respectively, output the initial tone burst, output the data burst or space, and output the space at the end of each bit. Nine bits are output: the eight data bits (LSB first) followed by a zero bit. The initial burst of the trailing zero is required in order to mark the end of the final space of the preceding data bit.

Each bit of the output routine is begun by outputting a tone burst: TAPEO:

```
MVI    B,9
TO1:   MVI    A,000H
        CALL   BURST
```

Register C is then rotated through CY:

```
MOV     A,C
RAR
MOV     C,A
```

CY is moved to the SOD enable bit position, A<sub>6</sub>, and A<sub>7</sub> is simultaneously set to one. All other bits are cleared. A tone or burst space is then output, depending on the previous contents of CY:

```
MVI     A,0,1H
RAR
RAR
CALL    BURST
```

The accumulator is cleared and a space output:

```
XRA     A
CALL    BURST
```

Cycling continues until the full 9-bit sequence is finished:

```
DCR     B
JNZ     TO1
RET
```

The BURST subroutine executes the SIM instruction CYCNO types at regular intervals. In between each SIM, bit A<sub>7</sub> is complemented. CYCNO should be an even number. If A<sub>6</sub> is set, a square-wave tone burst is created (upon calling BURST). Otherwise, the same code sequence is followed, but SOD does not change, and a space results.

```
BURST:  MVI     D,CYCNO
BU1:    SIM
```

```
MVI     E,HALFCYC
BU2:    DCR     E
        JNZ     BU2
        XRI     80H
        DCR     D
        JNZ     BU1
        RET
```

### INPUT ROUTINE

TAPEIN uses a subroutine called BITIN to move the data at the SID pin into the CY. The maximum rate at which SID is read is limited by a delay loop in BITIN.

Subroutine TAPEIN begins by initializing the bit counter and register D, which will keep track of the tone burst time. If a tone burst is being received when TAPEIN is called, further execution waits until the burst is over:

```
TAPEIN  MVI     B,8
        MVI     D,00H
TI1:    CALL    BITIN
        JC      TI1
        CALL    BITIN
        JC      TI1
```

Throughout this subroutine, a level transition is recognized only after it has been read once and then verified on the next reading. This provides a good degree of noise immunity.

The wait continues until the start of the next burst:

```
TI2:    CALL    BITIN
        JNC     TI2
        CALL    BITIN
        JNC     TI2
```

The next burst having now arrived, TAPEIN keeps reading the SID pin periodically, decrementing register D (thus making it more negative) each cycle until the pause is detected:

```
TI3:    DCR     D
        CALL    BITIN
        JC      TI3
        CALL    BITIN
        JC      TI3
```

When the pause is detected, the subroutine continues reading the SID pin, incrementing the D register (back towards zero) each cycle until the next burst is received: TI4:

```
INR     D
        CALL    BITIN
        JNC     TI4
        CALL    BITIN
        JNC     TI4
```

If, at this point, the burst lasted longer than the space, D has not been incremented all the way back to zero; it is still negative. However, if the space was longer, D has been incremented up through zero and is now positive. The sign bit of D thus corresponds to the data bit that will lead to each of these results. The sign bit is now moved into the CY, then rotated into register C:

```
MOV     A,D
RAL
MOV     A,C
RAR
MOV     C,A
MVI     D,00H
```

This is continued until the last bit has been received:

```
DCR     B
JNZ     TI3
RET
```

BITIN waits a short time in order to regulate the sampling rate, then reads SID and moves the data bit into the CY: BITIN:

```
MVI     E,CKRATE (7)
BI1:    DCR     E (4)
        JNZ     BI1 (7/10)
        RIM (4)
        RAL (4)
        RET (10)
```

The tone burst frequency and duration, and the TAPEIN sampling rate, are determined by HALFCYC, CYCNO, and CKRATE. Tables 1 and 2 give typical values.



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Table 1. Example Combinations of Halfcyc and Cycno  
All Values in Decimal

APPROXIMATE TONE FREQUENCY	CORRESPONDING HALFCYC VALUE	RESULTING DATA RATE			
		8 4	20 10	100 50	CYNCO CYC/BURST
500 Hz	217	42	17	3.3	bps
1 kHz	108	83	33	6.6	bps
2 kHz	53	166	66	13	bps
5 kHz	20	414	166	33	bps
10 kHz	9	826	330	66	bps

Table 2. Maximum Sampling Rates for  
Various Values of CKRATE

CKRATE VALUE	SAMPLING RATE (INCLUDING CALL & RET)
1	17.6 μsec
20	104 μsec
80	378 μsec
250	1.14 msec

### VOLUME CONTROL

Since an automatic level control in the recorder's internal circuitry usually determines recording level, no other adjustment is possible. However, the playback volume control must be set for an optimum level. When the volume is set correctly, the logic signal output from A4 will have either a one-third or a two-thirds duty cycle. This can be monitored with an oscilloscope.

In the field, an old-fashioned mechanical-type voltmeter can be connected to the A4 output and the cassette recorder volume control adjusted until the meter needle hovers somewhere between one-third and two-thirds of the high level output voltage. In practice, there is a wide range of acceptable settings. (Note: Since the quivering meter needle is being used here for inertial signal averaging, a digital voltmeter would not be very useful in this application.)

### A FEW HINTS...

The two primary subroutines TAPEO and TAPEIN are intended for use as "building blocks" in the design of a more complete software package. A routine for reading large blocks of data from a tape cassette would simply call TAPEIN repeatedly to read in individual bytes of data, then move the data from register C to the appropriate RAM location. Similarly, a block recording routine could be implemented by loading sequential memory locations into the C register and calling TAPEO.

Depending on the individual application, these block processing routines could also provide for formatting of the data recorded, e.g. adding parity or checksum information, file headers, etc. The block record software should also produce an extended-duration tone burst to allow time for the recorder's Automatic Gain Control and other analog circuitry to stabilize before any data is presented.

Depending on the quality of the recorder used, the tone burst frequency and duration can be optimized for higher data rates by modifying HALFCYC and CYCNO. If this is done, CKRATE should also be reduced so that between 10 and 80 samplings are made during a single (one-third width) tone burst. At greatly increased frequencies, some of the components in the analog interface might also be modified.

When using a cassette at the beginning of a side, remember to wait until the tape leader has passed before starting to record. Otherwise, data will be lost.

With the MPU and interface used here, the least expensive recorder worked perfectly well, but the quality of tape cassette used can affect the accuracy of the data. Therefore, while one could scrimp on the recorder, it is not wise to do so with the tape. □



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## Microcomputer Systems

### Model One Home Computer System

The Model One comes complete with a full, 53-key typewriter keyboard and a built-in cassette tape deck.

Designed as a self-contained computer console, the Model One includes 8K RAM and 2K ROM resident memory.



The unit also has a cassette tape system for storage of programs, output data, music and voice; joystick controls; full color TV output display, connects to standard home TV set; and music synthesizer, complex audio hardware and software.

The Model One has a suggested retail price of \$449.95. For more information contact Interact Electronics, Inc., P.O. Box 8140, Ann Arbor, MI 48107, (313) 973-0120, Michael Tucker.

CIRCLE INQUIRY NO. 243

### Keytrainer Audio/Visual Training System

Keytrainer modularity offers experienced data entry and word processing operators a unique opportunity to upgrade their skills, and

provides hands-on skill building for new operators as well.



Documented results show that the methods used by Keytrainer consistently increase productivity by up to 20 percent, with error reduction rates of up to 50 percent.

Keytrainer provides self-paced skills training with an easy-to-operate audio/visual unit featuring professionally designed 35mm filmstrips with synchronized sound. They are accompanied by a set of headphones, exercise manuals, keyboard charts, and an instructional handbook which includes progress sheets and a results chart.

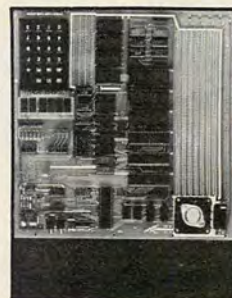
For more information contact Advanced Systems Inc., 1601 Tonne Rd., Elk Grove Village, IL 60007, (800) 323-0311, Keytrainer Coordinator.

CIRCLE INQUIRY NO. 231

### Superkim

The Superkim single board control computer is a powerful microprocessor control system and a complete microcomputer in one package. The board itself is 11½" x 11½" x ½" fiber-

glass reinforced epoxy plastic and is double sided with plated through holes.



The board is fully socketed for simple servicing and simple expansion to 4K RAM and 16K EPROM on board. It has fully decoded address space for expansion to 65K bytes of memory and I/O.

The Superkim is available for immediate delivery and sells for \$395. Dealer inquiries are invited. For more information contact Microproducts, 1024 17th St., Hermosa Beach, CA 90254.

CIRCLE INQUIRY NO. 239  
**NOVAL 770**

The Noval 770 is a new business microcomputer housed in an attractive wood desk. The 770 uses Intel boards fully Multibus compatible, comes with 48K bytes RAM, a 12" 30 lines of 80 characters, upper and lower case CRT display, two to four Shugart 800 floppy drives and controller, professional keyboard and numeric keypad.



The unit also has an output connector to Centronics or Qume printer, and extended BASIC under CPM with text editor in addition to its Z80 assembler, program debugger, and utility routines.

Options include electronics only without desk, or printer, or CRT, a serial/parallel I/O board, graphics display board, and four additional 16K banks of system RAM.

The Noval 770 is sold in business system configurations by Computall Corp., 2740 S. Harbor Blvd., Suite K, Santa Ana, CA 92704.

CIRCLE INQUIRY NO. 238

### RCA Reduces Price on VIP Home Computer

The price on the fully assembled RCA VIP (Video Interface Processor) home computer has been reduced to \$249 from \$299.95 effective June 1, 1978.

The VIP is a microcomputer based on the RCA COSMAC (CDP1802) microprocessor, and is designed to interface directly with a video monitor or modified TV set. It is provided with an interpretive language which makes it easy for the user to write graphic games and other applications without having to learn machine language.

The VIP contains a 16-key keypad for entering programs and has a built-in audio cassette interface to permit storing programs on a cassette. Documentation provided with the VIP contains listings for twenty games for use on the system.

For further information contact RCA COSMAC VIP Marketing, New Holland Ave., Lancaster, PA 17604, (717) 291-5848, Rick Simpson.

CIRCLE INQUIRY NO. 229

### The TaskMaster

The TaskMaster is a totally integrated small business system which provides small business powerful, and easy to operate data and word processing capability. The system consists of a flexible disk-based microcomputer, a full-page video screen, operator controls, and a 45 cps daisy wheel printer.



The system's hardware provides the user with sophisticated microprocessor architecture, 64K memory (8K ROM, 56K user RAM). The unit is provided with a dual diskette drive. Space is provided for expansion to a second dual diskette.

The TaskMaster includes a proven general business software package, the Accountmaster, which performs a full range of accounting functions. For more information contact Data Terminals and Communications, 590 Division St., Campbell, CA 95008.

CIRCLE INQUIRY NO. 246

### The General

The General is a self-contained computer system. Standard features on this system include 4MHz Z80A processor; 32K x 8 High speed (4MHz) dynamic RAM standard, 128K capacity on board. Memory mapping can address 1 megabyte; one micro-floppy disk drive with 300K bytes of capacity standard, (a second disk drive is optional).

The video display is 80 x 24 lines with upper/lower case, blink, reverse video, half and zero

intensity, protected field, graphics with special graphics characters.

Software definable optional character sets, 22MHz, 800 line length high resolution built-in monitor, 77-key reed switch keyboard built-in, with numeric entry pad, special functions keys (cursor control, etc.), interrupt controller and 4-channel DMA controller are also included.

Four sets of memory mapping registers allow foreground, background, multi-tasking software implementation. Up to 96K of ROM may be placed in the system for turnkey applications. There is also separate video RAM — 4K x 16 bits.

A second 350K micro-floppy disk, additional 32K RAM boards, additional ROM software packages and support boards for specific I/O devices are among the options available for The General.

For more information contact Xitan, Inc., P.O. Box 3087, 1101-H State Rd., Princeton, NJ 08540, (609) 921-0321.

CIRCLE INQUIRY NO. 226

### The Sorcerer™

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Suggested retail price is \$895. For more information contact Exity Inc., Data Products Div., 969 W. Maude Ave., Sunnyvale, CA 94086, (408) 736-2110, Paul Terrell, Marketing Mgr.

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### The Basic Controller™

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nels of each in such a way that the user need not know anything more about them than their names.

The Basic Controller retails for \$1095, assembled, tested and warranted for one year. For more information contact Dynabyte, Inc., 1005 Elwell Court, Palo Alto, CA 94303, (415) 494-7817, Rick Mehrlich.

CIRCLE INQUIRY NO. 245

### VP Series Computers

This new computer system is housed in a desktop cabinet and is aimed as small business users, general computer applications and modularized process control for OEMs.

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All components are mounted on a single PC board for use by OEMs. Interface Electronics and card cage are available for use with S100 boards. The main CPU board allows expansion to 48K RAM, 8K EPROM, 4 additional counter-timers, and 48 programmable I/O lines. The Disk Controller included works with either 8 in. or 5 1/4 in. floppy drives from a variety of manufacturers, and supports 3 additional drives.

The Entire VP Series includes the CPM Disk Operating System. Also available are several BASIC Interpreters and the C-BASIC Compiler. Text Editing and Assembler are included with the software.

The VP Series is available in desktop or desk-mounted versions. A complete business accounting and inventory system has been developed for use with the VP as well as several application programs.

The smallest system, VP-80 including 32K RAM and CPM operating system is available to dealers and educational facilities for \$3995. Complete systems with business software and printer are available from dealers.

All units come completely assembled and fully tested. For more information contact Data World Inc., 7541 Ravensridge Dr., St. Louis, MO 63119, (314) 961-2229, Kenneth Taggart.

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### 16-bit Single Board Computer

The microNOVA™ Board Computer MBC/1 is a single board computer offering minicomputer performance and systems capability combined with microcomputer board technology and economy.



The MBC/1 includes a 16-bit microNOVA CPU, 2 K-bytes of static RAM, sockets for up to 4 K-bytes of PROM memory, an asynchronous communications interface, and a 32-line digital input/output port — all on a single 7.5" x 9.5" board.

Software for the MBC/1 includes a multitasking support package (MBC/M) that provides an emulator for program development under all Data General operating systems and a monitor for program execution on MBC/1.

For more information contact Data General, Route 9, Westboro, MA 01581, (617) 366-8911, Richard Goldberg, Ext. 4755.

CIRCLE INQUIRY NO. 249



# Peripherals

## Light Pen

The "Vidiet-Stik" (Video Integrated Electronic Tracking) light pen requires only three connections and is compatible with virtually all mini/micro computer systems. The pen can be used for keyboard substitution with real-time definition of key positions, interactive games, educational drills for pre-schoolers, 'menu' selection; 'joystick' substitution; electronic music keyboard replacement.

Vidiet-Stik software is compatible with all 8080 and Z80 based systems. It is easily adapted to all other mini and micro systems. Each unit includes the assembled and tested pen, complete computer interface instructions, operating documentation, as well as checkout and game software listings.

The Vidiet-Stik is available for \$39.95 plus \$1.50 for postage and handling. Delivery is 4-6 weeks. To order or for more information contact Esmark, Inc., 507½ E. McKinley Hwy., Mishawaka, IN 46544.

CIRCLE INQUIRY NO. 315

## PROM Programmer Adaptor

An interface adaptor that permits an Intel MDS-800 development system to directly control and communicate with a Pro-Log Series 90 PROM Programmer is available from Computer Applications.

Supplied with the hardware interface is an MDS program which provides the capability to read data from paper tape, disk file or PROM, display and edit the data, and then program and verify PROMs.

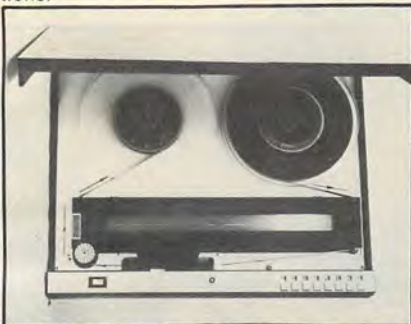
A cable supplied with the adaptor kit connects the MDS-800 PROM connector to the adaptor which plugs into the parallel interface connector on the Series 90 Programmer.

The PROM Programmer adaptor is available from stock at a price of \$475. For further information contact Computer Applications, 3030 Brideway, Sausalito, CA 94955, (415) 332-9401, Arthur Jopling or Jeffrey Scott.

CIRCLE INQUIRY NO. 320

## Series 900X Tape Transport

The 900X Tape Transport uses full microprocessor control, incorporating a Z-80 microprocessor. The drive, a 75 ips vacuum column transport, is finding ready acceptance in data handling for a wide variety of applications.



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For more information contact Cipher Data Products, Inc., 5630 Kearny Mesa Rd., San Diego, CA 92111.

CIRCLE INQUIRY NO. 318

## Data General Has In-House Manufactured Computer System Printers

Models 6073 and 6074 Dasher™ LP2 Printers are 180 CPS logic-seeking bidirectional matrix printers providing line printer throughput.

The integration of Data General's 16-bit microNOVA™ microprocessor and firmware-driven operation significantly enhances DG's ability to supply users with cost-effective solutions to high speed hard copy requirements.

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The new models are receive-only (RO) devices with parallel interfacing for high speed output. Their 180 CPS speed and full 132-column print width (10 characters/inch) result in speeds from 80 LPM for 132-character lines to 300 LPM for lines of 20 characters.

The full 96-character ASCII upper and lower case character set is available on both models with international fonts for many European countries. A Top Of Form control allows users to select form lengths of up to 99 lines (16½"). Six-part forms four to 15 inches in width maybe

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- 250K Bytes per Diskette
- DiskATE Assembler and Editor on Diskette
- CP/M Disk Operating System Available
- Customized I/O Routine for Most Systems

Single Drive System	\$ 995
Dual Drive System	\$1790
CP/M Operating System	\$ 70

BERKELEY: 1514 UNIVERSITY AVE., (415) 845-6366

SAN FRANCISCO: 4014 GEARY BLVD., (415) 387-2513



accommodated. The cartridge ribbon with lifetime of greater than four million characters is easily operator interchangeable.

For more information contact Data General, Route 9, Westboro, MA 01581, (617) 366-8911, Richard Goldberg, Ext. 4755.

CIRCLE INQUIRY NO. 317

### Sprint 5

Computer Textile announces that it is now carrying the new Qume Sprint 5 line of daisy-wheel printing terminals and accessories. The Sprint 5 is available in both 45 and 55 cps versions, both with and without keyboards. Each Sprint 5 model provides the highest quality word-processing and plotting printouts.

Over 50 different daisywheel type fonts are available. Pricing is as follows: 45 CPS, keyboard, \$2995; 55 CPS, keyboard, \$3295; 45 CPS, receive only, \$2695; 55 CPS, receive only, \$2895; Forms tractor, \$210; Pin Feed Platen, \$160. Delivery is from stock to 90 days, depending on model and configuration. Includes 120 days factory warranty. Tax and shipping not included.

For more information contact Computer Textile, 10960 Wilshire Blvd., Suite 1504, Los Angeles, CA 90024, (213) 477-2196.

CIRCLE INQUIRY NO. 319

### Jack Point for Remote Communication

The low cost Termiflex BB/1 Jack Point is a power and signal distribution device through which a Termiflex HT/3, HT/4, or HT/5 control/display unit can communicate with equipment 20 to 2,000 feet away.

Designed for use singly or in series in industrial plant-type facilities, the unit mounts in a standard 4" square electrical box and accepts an easy-to-insert conventional phone jack connector attached to the control/display unit cord.



The Termiflex BB/1 Jack Point is priced at \$100 each. For more information contact Termiflex Corp., 17 Airport Rd., Nashua, NH 03060, (603) 889-3883, Peter Clark, Marketing.

CIRCLE INQUIRY NO. 328

### Compact, Low-Cost Alphanumeric Printers

The DigiTec 6410 and 6420 are small desktop printers which print 20 columns of alphanumeric characters first-line-up like a person normally reads.



An internal microprocessor makes these new printers reliable and easy to interface. The Model 6410 provides a serial interface to RS-

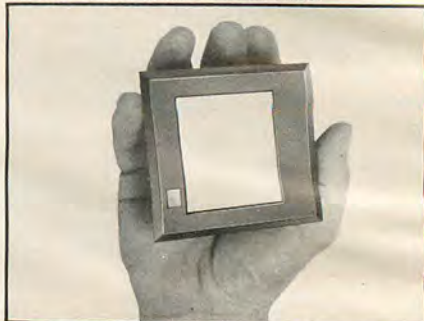
232-C and 20 mA current loop systems at 110 baud. The Model 6420 works with 8-bit parallel bus systems at up to 1000 characters/second. They both respond to the popular ASCII input format.

Price is \$295 in 100 quantities, \$395 in 1-9 quantities with off-the-shelf delivery. For more information contact United Systems Corp., 918 Woodley Rd., Dayton, OH 45403, (513) 254-6259, Gary Day.

CIRCLE INQUIRY NO. 327

### Mini-Cassette Tape Transport

The new Model CM 600 Mini Dek measures only 3½ inches square and less than 2½ inches deep. The package contains all motor control and read/write electronics.



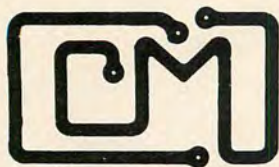
This new product is of special value as a flexible program source, for temporary storage and retrieval, archival storage and retrieval, and as an internal source for diagnostics. It can handle long-term, low-speed data logging, and other portable or remote applications because of low battery drain.

Price is less than \$75 in OEM quantities of 1,000. For more information contact Braemar Computer Devices, Inc., 11950 Twelfth Ave. So., Brunsville, MN 55337, (612) 890-5135.

CIRCLE INQUIRY NO. 152

# COMMODORE PET

**Now Computer Mart of New York has the Commodore PET with our great service and the PME-1 Memory Expansion Board.**



COMPUTER MART OF NEW YORK, INC.  
118 Madison Ave.  
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**PET WITH 8K MEMORY - \$795.00**  
**8K PET WITH PME-1-24K - \$1,385.00**  
**8K PET WITH PME-1-32K - \$1,465.00**

**Commodore Pet 2020 Printer \$695.00**





### A 242 A/36 Acoustic Coupler

The A 242 A/36 acoustic coupler with transistor to transistor logic (TTL) was made specifically for DEC's LA 36 teleprinter terminal.



The A 242 A/36 offers full duplex 103/113 operation at up to 450 baud. The unit has a new cup design with positive handset lock and direct microphone-handset coupling technique. The coupler features direct connection to terminal via permanently attached J4 cable.

To increase accuracy of transmitted/received data, the unit has a built-in quartz crystal controlled circuitry, double flange seals, special circuitry for reduction of side-tone effects, and special rubber feed for extra vibration isolation.

Single quantity price is \$265. Quantity discounts are available. For further information contact Anderson Jacobson, 521 Charcot Ave., San Jose, CA 95131, (408) 263-8520, Bob Miller.

CIRCLE INQUIRY NO. 325

### 1299 BPS Full Duplex Acoustic Coupler

A new 1200 bit per second full duplex acoustic coupler is now available from Anderson Jacobson (AJ) as the AJ 1234 and Racal Vadac as the VA3434.



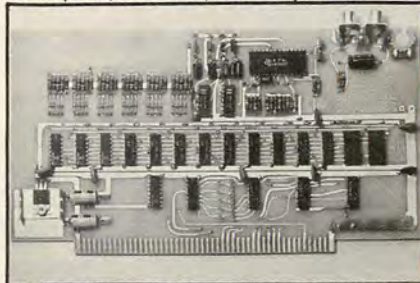
The new acoustic coupler provides an asynchronous 1200 bps full duplex interface to the computer or terminal but transmits information on a synchronous basis between itself and the remote modem. Users may also select DAA operation.

The unit price for the AJ 1234/VA3434 is under \$900. OEM quantity prices are available. For more information contact Anderson Jacobson, 521 Charcot Ave., San Jose, CA 95131, (408) 263-8520, Bob Miller, Product Mgr., Data Communications Division OR Racal Vadac, 222 Caspian Dr., Sunnyvale, CA 94086, (408) 744-0810, Tom McShane, Vice Pres., Marketing.

CIRCLE INQUIRY NO. 441

### New and Unusual Sound Effects and Music Board

The  $\mu$ Sounder (MicroSounder) is a S-100 compatible sound effects board which can be programmed in BASIC or assembly language. One to five lines of code generates such sounds as organ music, sirens, phasers, shot guns, explosions, trains, bird calls, helicopters, race cars, and many more.



The  $\mu$ Sounder is a complex sound generator that includes a noise generator, a super-low-frequency oscillator, and a voltage-control oscillator. These together with a noise filter, attack/decay circuitry, mixer, audio amplifier, and control circuitry provide noise, tone, or low-frequency sounds and any combination of these.

Price is \$149.95 assembled and tested, with 90 day limited warranty. Delivery is from stock to 3 weeks. For more information contact Bootstrap Enterprises, Inc., 100 N. Central Expressway, Richardson, TX 75080, Inquiries Mgr.

CIRCLE INQUIRY NO. 371

## Disks

### New Mass Storage Unit from PolyMorphic Expands System 88

The 88/MS increases the storage capabilities of its System 88 microcomputers. The 88/MS consists of two drives for 8-inch magnetic storage disks.



Mass storage is possible through the use of disks that are not only larger than mini-floppy disks but will store twice as much information per square inch and store it on both sides.

A System 88 microcomputer with one or two 88/MS units will handle all the files and processing needs of most small businesses and professional offices.

For more information contact PolyMorphic Systems, Inc., 460 Ward Dr., Santa Barbara, CA 93111.

CIRCLE INQUIRY NO. 160  
**Selecto-Sync™**

The Selecto-Sync system provides from 1/4 to 24 times the standard cassette speed. This range of synchronous speeds extends the usefulness of cassette recording for such diversified applications as extreme low speed data acquisition systems, low speed recording with high speed playback, high speed system loaders, directly synchronized multiple deck operations, high speed tape duplication, and critical timing operations.



The Selecto-Sync system works on the phase-lock principle and provides precise digitally-selectable tape speeds with very low flutter and wow. The system is featured in two configurations: direct capstan drive and indirect capstan drive.

For more information and prices contact Triple I, Applications Engineering Dept., 4605 No. Stiles, P.O. Box 18209, Oklahoma City, OK 73154, (405) 521-9000.

CIRCLE INQUIRY NO. 166

### Dual-Floppy, Z-80 Based Microcomputer

The Vector MZ is a new high-performance low-cost microcomputer featuring two Micropolis quad-density floppy disks and a powerful Z-80 CPU.



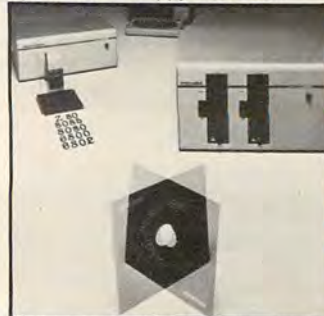
The MZ is a versatile general purpose byte oriented digital computer based on the powerful Z-80 microprocessor and S-100 bus. Outstanding features include the Z-80 CPU with 158 basic machine language instructions and a minimum instruction cycle of two microseconds. An 18-slot motherboard provides flexibility and expansion capabilities for up to 64K of directly accessible memory using a parallel 8-bit word/16 bit address.

Price for the MZ is \$3750. A single disk version is available for less than \$3,000. Both may be purchased at all authorized Vector Graphic dealers. For more information contact Vector Graphic Inc., 790 Hampshire Rd., Westlake Village, CA 91361, (805) 497-6853, Yvonne Beck.

CIRCLE INQUIRY NO. 167

### 1 Megabyte and 2 Megabyte Floppy Disk Units

Futurdata Computer Corporation Universal Microcomputer Development Systems offer double-density and double-sided, double-density dual drive floppy disk units.



Microsystem/31 is offered with double-density disk. This system may be ordered with 8080, 8085, Z-80, 6800 or 6802 microprocessor. The system is complete with 16K bytes of



RAM, CRT display, keyboard, dual drive 8" double-density floppy disk unit, DOS software on diskette and a full set of manuals.

Microsystem/32 is identical, except double-sided, double-density storage provides 1,025,024 bytes or 2,050,048 bytes per dual drive system.

Price of Microsystem/31 is \$7,795, and Microsystem/32 is \$8,975, available in 60 days. For more information contact Futuredata Computer Corp., 11205 So. La Cienega Blvd., Los Angeles, CA 90045, (213) 641-7700, R. Schaaf.

CIRCLE INQUIRY NO. 147

### 8" Floppy Disk System for SWTPC 6800

The DMAF1 is a dual drive, single density, double sided 8" floppy disk system. The hardware consists of a SS-50 bus (SWTPC 6800) compatible DMA controller capable of handling up to four drives, two CalComp 143M double density rated disk drives, aluminum chassis, regulated power supply, drive motor control board, cooling fan, diskette and interfacing cables.



The supplied software includes a powerful and easy to use microcomputer disk operating system, an 8K BASIC interpreter, with disk file capability and string functions.

The system is available in assembled form for \$2,095, and kit form (the drives themselves are fully assembled) for \$2,000. For more information contact Southwest Technical Products Corp., 219 W. Rhapsody, San Antonio, TX 78216, (512) 344-0241.

CIRCLE INQUIRY NO. 148

### Over Two Megabytes with Imsai's PCS-80/21,22

Imsai Manufacturing Corporation now offers floppy disk systems that control up to four random access CalComp disk drives. Two CalComp system configurations are available based on two disk interfaces, the DIO-D Controller and the FIF Controller.

The DIO-D Controller, compatible with all Imsai 8080/85-based computers, supports up to four single and/or double density disk drives and up to three single density mini-disk drives, providing an expansion capability of over two megabytes. Under software control, the DIO-D controller selects density (single or double) and type of drive being used (standard or mini).

The FIF Controller, compatible with Imsai's I-8080 microcomputer, supports up to four floppy disk drives in single density. The FIF is a two board interface that contains a complete 8080A-based single board microcomputer configured as an intelligent interface controller. The FIF moves data between the system's microprocessing unit and the peripherals via a Direct Memory Access Channel (DMA).

PCS-80/21,22 systems are available in table top or rack mount versions. A table-top cabinet houses two drives. For more information contact Imsai Manufacturing Corp., 14860 Wicks Blvd., San Leandro, CA 94577, (415) 483-2093.

CIRCLE INQUIRY NO. 144

### New H8 Floppy Disk Kit from Heath

The H17 kit version is identical in features and specifications to their assembled WH17 floppy. These include 102K bytes of available

storage area per disk, a fully-assembled Wangco Model 82 disk drive (expandable to dual disk), the interface/disk controller circuit board kit which plugs directly into the H8 mainframe, and a self-contained power supply. The storage media is the expanded 40-track seek time and a typical random sector access time of less than 250 milliseconds for the new unit.

The operating system software for the H8/H17 Floppy Disk System is available and designated H8-17. This software includes the Heath Disk Operating System (HDOS) with diagnostic for unit evaluation and optimization; the BUG-8 console debugger; TED-8 text editor; HASL-8 assembly language and extended Benton Harbor BASIC. An extra diskette is also included.

Price for the H17 is \$530; the H17-1 optional second drive is \$295; and the H8-17 operating system software is \$100. All are mail order. For more information write Heath Company, Dept. 350-680, Benton Harbor, MI 49022.

CIRCLE INQUIRY NO. 145

### Expand North Star System to 600K Bytes

The H & H Texan expands North Star floppy disk capacity from 90K bytes to 600K bytes with total software compatibility. This gives 20% greater capacity than a dual drive 8-inch floppy, at two-thirds of the cost.

With the H & H Texan files can be created for 3,000 accounts receivable invoices or 80 pages of text for word processing applications.

The H & H Texan is available in three models; a single disk with 197K bytes for \$595; dual drive with 394K bytes for \$995; and three drives with 591K bytes for \$1,420. For complete information contact General Electronic Marketing, 7315 Ashcroft, Suite 110, Houston, TX 77801, (713) 772-9893.

CIRCLE INQUIRY NO. 146

### Four-Headed Voice Coil Floppy

The new PerSci Model 299 Diskette Drive is a "four-headed" flexible disk drive which will store up to 3.2 Mbytes of data in the space required by a standard size floppy drive. The drive, interfacing to 8080, 6800 and Z-80 based systems as well as minicomputers, provides the basis for a low cost, independent data management system.



The Model 299 is a dual-headed, dual diskette drive reading and writing both sides of two 8" diskettes. Data can be encoded in single or double density in IBM compatible soft sector formats or expanded hard and soft sector formats on IBM Diskette I, II, or IID or equivalent media.

Price is \$1,595 in single unit quantity. OEM discounts available. For more information contact PerSci, Inc., 12210 Nebraska Ave., W. Los Angeles, CA 90025, (213) 820-3764.

CIRCLE INQUIRY NO. 142

### Faster, Lower Cost Floppy Disk System from INFO 2000

The new high performance floppy disk system for S-100 bus microcomputers incorporates a controller board called DISCOMEM. This controller enables the manufacturer to offer much faster disk performance while lowering the overall cost of the disk system.



The S-100 disk system combines the PerSci Model 277 dual diskette drives with the DISCOMEM Controller Board and Digital Research CP/M to provide all necessary hardware and software for immediate operation, when added to any S-100 bus computer.

For more information contact Info 2000 Corp., 20630 S. Leapwood Ave., Carson, CA 90746.

CIRCLE INQUIRY NO. 143

### High Density 5 1/4-inch Floppy

A floppy disk subsystem tailored to the Intel 8010/8020 bus architecture has been developed in multiple configurations delivering up to 3 million bytes of formatted data storage.

The SBC-55 is a complete plug-compatible subsystem consisting of a dual-drive storage module, integral power supply, controller board, a MULTIBUS interface adaptor board, interconnecting cables, program development software supplied on two 5 1/4-inch diskettes, and a subsystem user manual.

A configuration containing a Model 1055 storage module has a 1.5 MByte capacity. The subsystem may be expanded by a Model 1035 dual-drive add-on module, which provides up to 1.5 million bytes of additional storage.

With a recording density approaching 400,000 bytes per surface, the SBC-55 offers development system users 8-inch drive capacities at 5 1/4-inch drive prices.

The SBC-55 unit price is \$2,300 for the single-sided, dual drive version and \$2,700 for the double-sided dual-drive model. The prices include, in addition to the above components, a microprocessor-based controller that performs data formatting, encoding and decoding, sector buffering, error detection and recovery, and other duties.

For more information contact Micropolis Corp., 7959 Deering Ave., Canoga Park, CA 91304, (213) 703-1121.

CIRCLE INQUIRY NO. 140

### Delta-1 Offers First Integrated S-100 Disk/Tape Capability

The Delta-1 double-density floppy disk storage system uniquely provides up to 200K bytes of storage on a single 5 1/4" drive.



Included with the Delta-1 disk system is the MFM S-100 Disk Controller which supports up to three SA-400 disk drives. The MFM Disk Controller can be used to combine the Alpha-1 Tape System and Delta-1 into a fully integrated tape and disk storage system.

The MFM Disk Controller card can double North Star disk storage space from 90K bytes to 180K.

For more information contact Meca, 7026 O.W.S. Road, Yucca Valley, CA 92284, (714) 365-7686.

CIRCLE INQUIRY NO. 141





**Non-Linear Systems, Inc.**

## MS-215 MINISCOPE



**Dual-Trace-2 Channel  
Separate, Chopped Or Alternate Modes**

MODEL NO.	NET	MODEL NO.	NET
MULTIMETERS		COUNTERS	
LM-3A	\$134.00	FM-3TB/115	\$ 93.00
LM-3A/LH	137.50	FM-3TB/230	95.00
LM-3.5A	155.00	FM-300TB/115	102.00
LM-3.5A/LH	158.50	FM-300TB/230	105.00
LM-40A	209.00	FM-7	215.00
LM-40A/LH	212.50	FM-7/LH	218.50
LM-4A	250.00	FM-7/PH	218.50
LM-4A/LH	253.50	SC-5	98.00
LM-300	114.00	SC-5/LH	101.50
LM-300/LH	117.50	SC-5/PH	101.50
LM-350	144.00	OSCILLOSCOPES	
LM-350/LH	147.50	MS-15	\$318.00
RMS-350	208.00	MS-215	435.00
RMS-350/LH	211.50		

BANK OF AMERICA AND MASTERCARD  
WELCOME. TERMS: MIN. ORDER \$10.00 ADD \$2.00  
POSTAGE AND HANDLING IF ORDER IS UNDER  
\$25.00 AND SENT U.P.S. ADD \$4.00 POSTAGE  
AND HANDLING IF SENT VIA U.S. MAIL.

## PRINTERS

SOROC 1Q120	995
LSI ADM3A	895
HAZELTINE 1500	1225
HAZELTINE 1510	1395
HAZELTINE 1520	1650
HAZELTINE Modular One	1995
PERKIN ELMER Fox-1100	1295
PERKIN ELMER Owl-1200	1995
INTERTUBR	784
MICROTERM ACTIV-A	550
MICROTERM ACTIV-B	800

## VIDEO TERMINALS

TTY Model 43	1277
TTY Model 40 (80 Col)	2960
TTY Model 40 (132 Col)	3760
Okidata Model CP110 (+Optns)	1295
Okidata Model 22	2695
TI Silent 700 Model 745	1995
TI Model 810 Serial, no opt	1895
TI 810 VFC, CP, Full ACSII	2295
NEC Spinwriter, RO, Friction	2775
NEC Spinwriter, KSR, Friction	3090
NEC Tractor Mechanism	140
XEROX 1700, KSR, Friction	3240
XEROX 1710, RO, Friction	2850
XEROX 1720, Comm. Term.	3450
XEROX Tractor Feed for Above	200
XEROX 1760, Matrix, 200 cps	3145
DECWRITER LA36, KSR	1654
DECWRITER LA180, RO	2295
CENTRONICS M779, Friction	1175
CENTRONICS M779, Tractor	1275
CENTRONICS M761, KSR	2025
CENTRONICS M761, RO	1895
CENTRONICS M703 Printer	2805

## COMPUTER COMPONENTS INC.

5848 Sepulveda Blvd., Van Nuys, CA 91411  
(213) 786-7411

4705 Artesia Blvd., Lawndale, CA 90260  
(213) 370-4842

6791 Westminster Ave., Westminster, CA 92683  
(714) 898-8330

3808 Verdugo Ave., Burbank, CA 91505  
(213) 848-5521

CLOSED SUNDAYS AND MONDAYS



# Terminals

## ADM-31 CRT Terminal

The ADM-31 is a new low-cost video display terminal featuring two pages of memory, function keys and complete editing capabilities. The smart terminal offers the user two full 1920 character pages of display with independent page characteristics of Protect, Write/protect, Program mode and Cursor retention.



The microprocessor-based ADM-31 is completely self-contained and comes equipped with keyboard, control logic, character generator, refresh memory and interface. The terminal's keyboard is integrated with main logic and can generate a full 128 ASCII character set.

Single quantity price is \$1,450. For more information contact Lear Siegler, Inc./Data Products Div., 714 N. Brookhurst, Anaheim, CA 92803, (800) 854-3805 and in California (714) 774-1010.

CIRCLE INQUIRY NO. 435

## APL/ASCII Video Terminal

The Elite 3045A is a low-cost, microprocessor-based fully buffered APL/ASCII video terminal. This new video terminal with transaction processing capability offers protected formats, video enhancements and APL overstrike/ASCII underscore.



The 3045A also features asynchronous and optional isochronous communications interfaces; 103 and 202 modem compatibility and switch-selectable EIA and optional 20 mA current loop interfaces.

Single quantity price is \$1,995 and \$1,520 in quantities of 100. Delivery is 60 days ARO. For more information contact Datamedia Corp., 7300 N. Crescent Blvd., Pennsauken, NJ 08110, (609) 665-2382.

CIRCLE INQUIRY NO. 430

## RM-3000 Series Independent Display System

The RM-3000 IDS is a new, complete family of stand alone imaging and graphics systems in color, gray scale, and black and white. The unit is designed for stand-alone, off-line processing in virtually any graphics or display application.

The 3000 IDS is based on the RM-9000 or RM-9050 Series display controllers and DEC's LSI-11 microprocessor. Display data can be processed from a number of different sources such as floppy disk, magnetic tape, disk packs, telecommunication links or directly from a host computer via modem control.

The basic RM-3000 IDS system includes an LSI-11 microcomputer with 64K bytes of RAM, floating point arithmetic, system monitoring unit, serial interface, dual floppy disk system, RM-9000 or 9050 Series display controller,



TR-11 I/O driver and a 48" or 72" desk console. U.S. prices start at \$18,200 with a 90-day delivery. For more information contact Ramtek Corp., 585 No. Mary Ave., Sunnyvale, CA 94086, (408) 735-8400, Mrs. Beverly Toms.

CIRCLE INQUIRY NO. 440

## Smart CRT Terminal

The ADM-42 is a low-cost video display terminal that comes standard with two 1920 character pages of memory that can be optionally expanded in two page increments to eight full pages. The unit features total flexibility of format, editing, interface and transmission.



All pages have independent Protect, Write/protect, Program mode and Cursor retention. The ADM-42 features a detachable keyboard with upper and lower case, numerics, punctuation, control, numeric keypad and 16 function keys as standard.

For more information contact Lear Siegler, Inc./Data Products Div., 714 N. Brookhurst, Anaheim, CA 92803, (800) 854-3805 and in California (714) 774-1010.

CIRCLE INQUIRY NO. 436

## Megraphic 5014

The Megraphic 5014 Refresh Graphics Terminal is designed to replace and to be upwardly-compatible with the Tektronix 4014 storage tube terminal. The 5014, with the proprietary software module EMUTEK™, is totally compatible with the 4014 and offers several major advantages.

Because it is a refresh system, the 5014 has the capability to display movement. Local translation, scale, zoom, selective erase, rotation and more are all possible with the 5014, but not with the 4014. Selective erase eliminates the need for the host computer to retransmit an entire picture to change one vector.

The 5014 is fully compatible with Tektronix TCS Plot 10™ and other software developed for Tektronix. With EMUTEK, the 5014 not only emulates the 4014, but also enables use of control codes not available on the Tektronix. This provides the additional benefits inherent in powerful vector refresh systems.

Megatek's modular approach to the manufacture of its equipment allows any 5014 user to expand easily to the Megraphic 5000 Re-

fresh Graphics System at any time merely by adding memory and local storage peripherals.

For more information contact Megatek Corp., Corrento Valley Industrial Park, 3931 Sorrento Valley Blvd., San Diego, CA 92121.

CIRCLE INQUIRY NO. 437

## Micro Bee 1

The Micro Bee 1 is an 8085A microprocessor-controlled video display terminal offering the latest advances in technology and human engineering. The machine features self-diagnostics.



The status line is used extensively by the Micro Bee 1 system firmware to display modes of operation, error messages, and communication protocol data as well as a status message showing all switch configurations.

Visual features of the Micro Bee 1 include normal, reverse, blink, underline, and half intensity video levels.

List Price is \$1395. For more information contact Beehive International, 4910 Amella Earhart Dr., Salt Lake City, UT 84125, (801) 355-6000.

CIRCLE INQUIRY NO. 372

## Flat-Surface, Tactile Response Custom Keyboards

Tactile feed-back keyboards, customized to each buyer's specifications, are available with a limitless variety of legends, colors, sizes, shapes and nomenclatures.



The new keyboards are available for every industry presently considering or using conventional or soft-touch keyboards. Among possible uses are data entry devices, test instruments, appliances like microwave ovens and televisions, communications equipment and much more.

The keyboards feature flat, spill-resistant surfaces designed for ease of maintenance. Designed for any configuration from a basic keyboard to total systems that include LEDs or other electronic components, the custom keyboards also feature sealed mounting to insure high reliability.

For more information contact Bowmar Instrument Corp., Commercial Products Div., 8000 Bluffton Rd., Fort Wayne, IN 46809.

CIRCLE INQUIRY NO. 425



## The Writehander™ Keyboards

The Writehander is a one-handed keyboard for computers, terminals, displays and other 128 character ASCII or ISO coded devices and is available in both right and left hand configurations in large and small sizes.



The new model features snap-action switches, improved circuitry, and Keypressed signals as well as Strobe pulses to signal that data are available.

As supplied by the manufacturer, the device is ready to connect and use. Five volt, 52 mAdc power is obtained from the inputted terminal. The Writehander is provided with a ribbon cable that has lines for the 7-bit code, high and low 1-bit fixed parity, high and low Strobe and Keypressed signals and the power and common lines.

Delivery is stock to 39 days. For more information contact the NewO Company, 246 Walter Hays Dr., Palo Alto, CA 94303, (415) 321-7979, Sid Owen.

CIRCLE INQUIRY NO. 438

## Micro Bee 2

The Micro Bee 2 is an 8085A microprocessor-controlled buffered video display terminal. Numerous features have been tailored to address both interactive and batch mode markets.



The Micro Bee 2 has a 25th line which distinct from the rest of the display memory and is used as a "status" line. The system firmware displays modes of operation, error messages, and communication protocol as well as terminal status messages on the status line. Standard visual attributes include normal, reverse, blink, underline and half-intensity video levels. These are further enhanced by the addition of logical attributes which include protected data fields, and numeric only fields, as well as modified data field transmission.

List price for Micro Bee 2 is \$1695. For more information contact Beehive International, 4910 Amelia Earhart Dr., Salt Lake City, UT 84125, (801) 355-6000.

CIRCLE INQUIRY NO. 424

## Processor Terminal

The new Processor Terminal series, designated the TEI PT208, is a complete and self-contained computer system with display, disk storage, a full keyboard and 8-slot motherboard.



It may be used either as a stand alone processor or as a processor terminal in a larger system. Features of the PT208 include a 9" high-resolution monitor, a full upper and lower case ASCII keyboard with eight user-designated special function keys and a 16-key numeric cluster pad. Two Shugart SA-400 mini-floppy disk drives are standard. The 8-slot mainframe contains a CPU board that features an 8080 processor and a special circuit that implements a start up "jump to" routine to any user selected byte address.

Price of the Model PT208 fully assembled and tested is \$4,695. For more information contact CMC Marketing Corp., 5601 Bintliff, Suite 515, Houston, TX 77036, (713) 783-8880.

CIRCLE INQUIRY NO. 426

# I/O Cards

## Three Modules Added to EH International's Product Line

Models 10800 and 150 driver modules and Model 700 high-speed I/O switch provide the user with standard functions that previously had to be developed in-house by test systems engineers.



The EH Modules are specifically designed for testing logic assemblies and integrated circuits. The Model 10800 is a 200 MHz ECL driver with a 600 picosecond risetime. The Model 150 40 volt driver is a DC-coupled general purpose data/clock driver. The Model 700 is a high-speed general purpose I/O switch that provides an inhibit switch for the driver's output.

Prices are \$115 for the 150, \$90 for the 700 and \$200 for the 10800. For more information contact EH International, Inc., 515 11th St., Oakland, CA 94606, (415) 834-3030.

CIRCLE INQUIRY NO. 174

## Model 8554-D Selector Switch

The Model 8554-D is a desk top A,B,C,D, Selector Switch and Monitor Module. The unit allows the user to select any one of four 25-wire EIA RS-232 digital interfaces. A rear panel 25-pin connector provides access for monitoring the entire interface.

In application, the Model 8554-D allows the user to select any one of four modems or four terminals. A four-position rotary switch on the front panel instantly switches all EIA signals (except frame ground) from the rear panel male connector labeled COMMON to any one of four

female connectors labeled A, B, C, and D. A sixth rear panel MONITOR connector allows the data signal to be analyzed by diagnostic test equipment.

Price is \$305; delivery is 30 days ARO. For more information contact International Data Sciences, Inc., 7 Wellington Rd., Lincoln, RI 02865, (401) 333-6200, Marketing Dept.

CIRCLE INQUIRY NO. 176

## Analog Input Board

The AIB is an S-100 bus compatible analog input subsystem which accepts multiple low-level analog signals, multiplexes, and converts to digital format with 12-bit resolution and throughput rates up to 8 KHz.



The standard AIB accepts 8 differential/16 single-ended inputs and is optionally expandable to 16 differential/32 single-ended. Other AIB options include computer programmable gain, 4-20 ma current inputs, and super low drift.

The AIB is priced at \$495 in small quantities. Delivery is within 30 days. For more information contact Signal Laboratories, Inc., 202 N. State College Blvd., Orange, CA 92668, (714) 634-1533, Russ Quackenbush.

CIRCLE INQUIRY NO. 175

## "Floppy I/O" Card

A single I/O card for the S100 bus contains 4 programmable parallel ports, 2 duplex serial ports, baud rate generator, 2 16-bit program-

mable interval timers, room for up to 16K of EPROM (2708, 2716, 2732), and a connector to adapt the PerSci 1070 Intelligent Floppy Disk Controller to the S100 bus.

This single card can interface CRT terminals, keyboards, printers, paper tape readers, EPROM programmers, up to four floppy disk drives (with controller) and still provide EPROM space and 2 16-bit timers. The "Floppy I/O" Card is compatible with Altair 8800, Imsai 8080 and the CGRS 6502/S100 MPU.

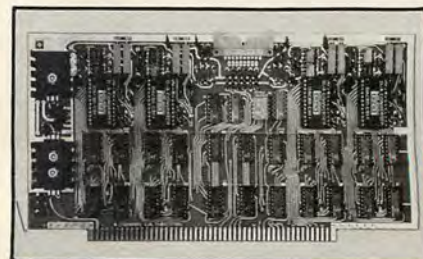
The "Floppy I/O" is available in kit form for \$169.95, and assembled for \$219.95. For more information contact CGRS Microtech, P.O. Box 368, Southampton, PA 18966.

CIRCLE INQUIRY NO. 170

## Four Channel D/A Converter

A four channel, high quality, D/A converter is now available for use with Z80 to 8080/8085 microprocessors.

The S100 bus compatible D/A board has 12 bit resolution and uses plug-in hybrid D/A converters with  $\pm 1/2$  LSB accuracy.



The power requirements are compatible with S100 bus voltages: +8 volts at 338 ma, +18 volts at 122 ma, and -18 volts at 156 ma.

The output is 10 volts F.S. or 20 volts F.S. (strap selectable). The output range may be  $\pm 5$  volts,  $\pm 10$  volts, 0 to +10 volts, or 0 to -10



volts. Input coding maybe either binary to two's complement.

Price on single quantity is \$495. Delivery is stock to one week. For more information contact California Data Corporation, 3475 Old Conejo Rd., Suite C10, Newbury Park, CA 91320, (805) 498-3651.

CIRCLE INQUIRY NO. 169

### Video Interface Boards with Protected Fields and Screen Read

The CRT-2000 and CRT-3000 are both available in 50Hz and 60Hz, and with user definable character sets.

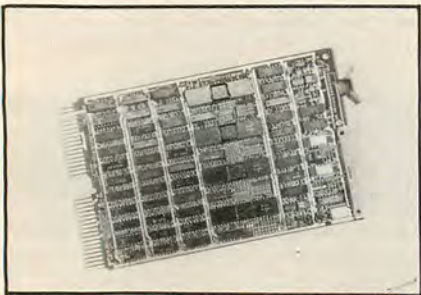
Both boards are based on the SFF96364 CRT Processor Chip and are pin compatible with the popular CRT-1000.

Price for the CRT-2000 is \$149.95 and the CRT-3000 is \$159.95 — both in single quantities. Available from stock. For more information contact Nucleonic Products Co., P.O. Box 1454, Canoga Park, CA 91304, (213) 887-1010, Mike Levin, Product Manager.

CIRCLE INQUIRY NO. 183

### Serial Interface Card Compatible with LSI-11/2

The MSI11 is a new multiple channel serial interface card which provides 1, 2 or 4 asynchronous serial channels using EIA RS232 or 20ma current loop interfaces.



This card is compatible with LSI-11/2 and LSI-11 computer systems and is software compatible with the DEC DLV11. Sixteen data rates from 50 baud to 19.2K baud are jumper selectable on the card or remotely. All standard serial data formats are available.

The MSI11-1 single channel is priced at \$210. The MSI11-2 dual channel is \$295 and the MSI11-4 quad channel is \$450. Cable assemblies to convert the 10 line/channel interface at the card into a standard 25-pin connector are available. For more information contact Andromeda Systems, Inc., 14701 Arminta St., Unit J, Panorama City, CA 91402, (213) 781-6000, Jim Reynolds.

CIRCLE INQUIRY NO. 168

### General Purpose Interface Bus Transceiver

The new MC3448A Quad GPIB Transceiver converts TTL and MOS input and outputs to the IEEE 488-1975 Instrument Data Bus Standard. Featuring Three-State Outputs, High Impedance Inputs and Receiver Hysteresis, the fast interface operates from a single +5 volt supply.

All required terminations are internally provided by the MC3448A, which automatically protects the bus when the supply power is off, and during power up/power down transitions.

Available from stock in, prices in 100 up quantities are \$2.90 for the MC3448AL Ceramic DIP and \$2.75 for the MC3448AP Plastic DIP. For more information contact Motorola Semiconductor Products, Inc., P.O. Box 20912, Phoenix, AZ 85036, (602) 244-6900.

CIRCLE INQUIRY NO. 179

### Network Control Unit

The Model CU355 is a fully solid state Universal Network Control Unit with PROM memory. The new lightweight unit is ideal for inter-

facing high speed data terminals and word processing machinery to most common carrier and private switched networks.



Control unit to terminal signalling level is EIA RS232C and model CU355 accommodates Western Union Low Level ( $\pm 12V$ ) or EIA RS232C compatible modem on the network side. The cost effective unit can accommodate 2 terminals and 1 monitor position at speeds up to 9600 baud. In addition, Model CU355 features an alpha or numeric keypad for ease of operation in line conditioning, signalling and dialing.

For more information contact Multiplex Communications, Inc., 123 Marcus Blvd., Hauppauge, NY 11779, (516) 231-5350.

CIRCLE INQUIRY NO. 180

### Single Chip 8-Bit Bi-Directional Transceiver

A new 8-bit Tri-State™ bus transceiver provides bi-directional drive for bus-oriented microprocessor systems. Offered in a single 20-pin DIP, the INS8208B device is manufactured by low power Schottky technology.



The chip has 48 milliamperes drive capability on the B-port (Bus-transceiver) and 16mA drive capability on the A-port; an additional PNP transistor input on both ports allows reduced input loading.

The INS8208B is priced at \$4.35 in 100-unit quantities. Delivery is stock to 2 weeks. For more information contact National Semiconductor, 2900 Semiconductor Dr., Santa Clara, CA 95051.

CIRCLE INQUIRY NO. 181

### Peripherals Option Card

In order to give the 8085A CPU based microcomputer system users a host of add-on features, NMS has added a new peripherals option card. The 85/EX will allow the user the flexibility of continual expansion.

This card gives the user the option of an Arithmetic Processing Unit (AMD9511) providing high performance, 32 bit, fixed and floating point, arithmetic and floating point trigonometric operations. A 3MHz version is priced at \$422 and the 2MHz version is \$272.

A second option is an Interrupt Controller featuring the Intel 8259. This item resolves priority among eight different interrupt levels according to software algorithms provided by the user. This controller is available for \$90.

Other options made possible are an Interval Timer capability through the use of Intel's 8253 Programmable Interval Timer and includes 3 16-bit BCD or binary counters which are user programmable, for \$50 each; a Parallel I/O In-

terface using the Intel 8255A programmable peripheral interface device, providing 24 signal lines for transfer and control of data to or from the peripheral devices for \$90; and a Serial I/O Interface using Intel's 8251 USART device, when coupled with the 8255A parallel interface option and the 8253 interval timer, provides for complete RS232 serial data communications including IBM Bi-Sync, for \$70 plus the parallel and timer options required.

All the above prices are given without the required peripherals option card which retails for \$158. For more information contact Northwest Microcomputer Systems, 121 E. 11th, Eugene, OR 97401, (503) 485-0626.

CIRCLE INQUIRY NO. 182

### Telecommunication System for MITS 8800b Microcomputer

This system enables the MITS 8800b to be used as an intelligent terminal in two way communication with a remote time sharing device over the telephone lines using an acoustic coupler.

The telecommunication system consists of an assembly language routine and a nother program written in MITS disk extended BASIC. Control commands are provided to enable the operator to switch command console communication from the remote device to MITS and vice versa.

This system may be used to communicate and transfer any kind of data files to and from a remote time sharing device at speeds up to 300 baud. The hardware requirements are MITS 8800b with 32K core memory and one or more floppy disks. It is supplied on an 8" floppy disk with an 18 page User's Manual.

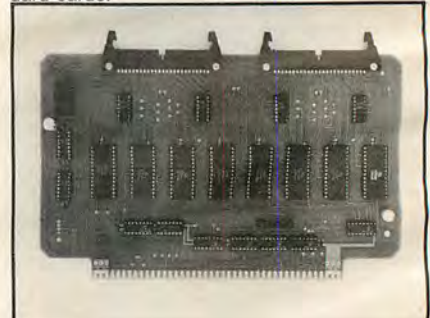
The system is priced at \$195, which includes the source listing. The user's manual may be purchased separately for \$20 for system evaluation and its cost may be applied towards the purchase of the telecommunication system at a later date.

For more information contact Microware-PBS, P.O. Box 47, Blacksburg, VA 24060, Mark Shelton.

CIRCLE INQUIRY NO. 177

### Multiple Programmable Timer Module

The 9460 is a support module specifically designed for compatibility with the M6800 microprocessors. It is pin and outline compatible with the Motorola EXORCiser™ and Micromodules™ and with other industry standard cards.



The 9460 provides an array of eight MC6840 triple programmable timers. Each timer occupies eight locations of memory address space and the boundaries for the array can be strapped for any 64 byte region of system memory. Each of the twenty-four individual timers on the board can provide many useful functions such as programmable frequency generation, real-time clock, frequency or time interval measurement, one-shot pulse generation, or event counting.

The 9460 is available from stock for \$395 in single quantities. For more information contact Creative Micro Systems, 6773 Westminster Ave., Westminster, CA 92683, (714) 892-2859.

CIRCLE INQUIRY NO. 178



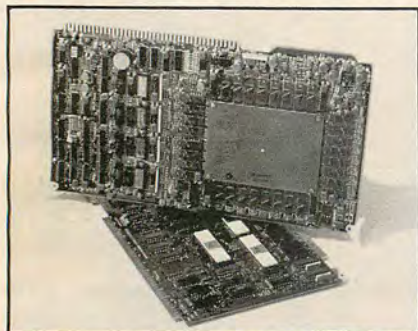




# Memory Cards

## Core Memory

A 16K byte random-access core memory for 8080 microcomputers is fully compatible with SBC 80 single board computers. The MCM-8080 provides non-volatile storage for 16,384 bytes (8 bits) and data access within 325 nanoseconds. The Read and Write cycle times are 780 and 1240 nanoseconds.



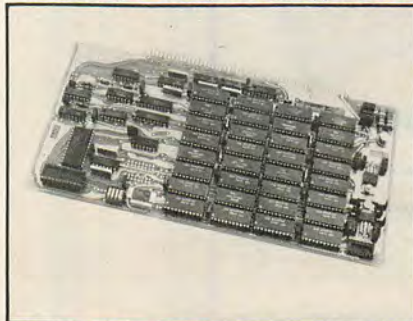
The MCM-8080 is a pin-compatible alternative to the SBC 016, SBC 046, SBC 416 and MDS 016 memory boards used with Intel SBC 80/05, 80/10 and 80/20 or equivalent computers. It can be used to provide up to 64K addressable locations for either 8 bit or 16 bit applications.

Single unit price is \$885. Delivery is from stock. OEM discounts available. For more information contact Ampex Corp., 200 N. Nash St., El Segundo, CA 90245, (213) 640-0150, Clyde Cornwell.

CIRCLE INQUIRY NO. 250

## Single Card Plug-In NMOS Memory

The Model 1104 is a 16K-word by 8-bit random access NMOS memory system that is S-100 bus and card size compatible. The Model 1104 is designed to provide exceptional speed and reliability in microprocessor applications.



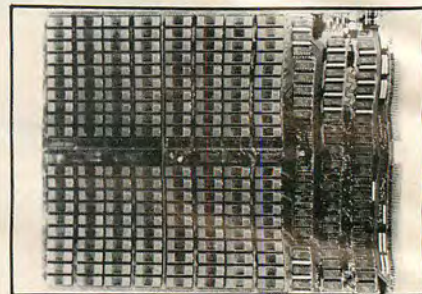
Model 1104 consists of the memory array with support electronics, including address and data buffering, timing and control, and voltage regulation. The memory array is divided into four 4K x 8 memory blocks, and each block can be assigned to a 4K address block within a 0 to 64K range. Operating modes are Read, Write and Deposit. The Deposit mode is a two-phase memory cycle consisting of a Write followed by a Read.

For complete information, contact Electronic Memories & Magnetics Corp., 12621 Chadron Ave., Hawthorne, CA 90250, (213) 644-9881, Ron Everlove.

CIRCLE INQUIRY NO. 254

## 32K x 21 Bit RAM Board

The MicroRAM™ 3420 is a 32K x 21 bit memory system contained on a single plug-gable pc board. It is compatible with the Micro-Memory™ 3000 system and can be plugged directly into that chassis.



The MicroRAM 3420 operates at a cycle speed of 425 ns (235 ns access). A Late Data Control will allow a delay in the execution of a write cycle pending the arrival of data. Read/Modify/Write cycles take place within 830 ns, which includes 150 ns of Modify time.

Typical power required is less than 30 watts in standby mode, and less than 40 watts in operate mode. The board has provisions for battery back-up.

OEM quantity price is \$1,995 each. For more information contact Electronic Memories and Magnetics Corp., Commercial Memory Products Div., 12621 Chadron Ave., Hawthorne, CA 90250, (213) 644-9881.

CIRCLE INQUIRY NO. 255

## Apple II and Centronics—an unbeatable pair.



Add 4K or 16K of memory. We'll delivery anywhere in the U.S., assembled and configured to your specification.

### We can deliver at unbeatable prices

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## SAVE \$240.00 on Micropolis Dual Drive Disk System!

Assembled and tested . . . we'll deliver to you from off our shelf.

### Business Software for MICROPOLIS and NORTH STAR DISK SYSTEMS

includes:

- Accounts Payable and Receivable
- Payroll for up to 600 employees
- General Ledger
- Inventory control handles 1400 items
- Customer Accounts list for 1200
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Delivered on diskette with full documentation.

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Tustin, CA 92680 • (714) 731-1686

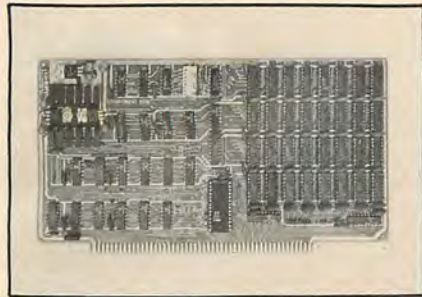
**HOURS**  
Monday-Thursday 11 - 7  
Friday 11 - 8  
Saturday 10 - 6



## Imsai Introduces New Dynamic RAM

RAM III, a new line of dynamic random access memory boards, is available in 32K byte or 64K byte versions.

Specifically designed for inclusion in Imsai's line of VDP desk top computers, the boards are also available for add-on to already existing systems.



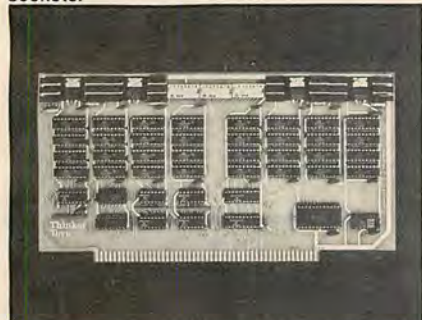
RAM III boards are S-100 compatible and do not obsolete already existing Imsai RAM boards. Latched critical signals eliminate noise susceptibility. The RAM chips and the refresh controller are socketed for ease of repair.

The 32K version retails at \$895 and the 64K version for \$1695. For more information contact Imsai Manufacturing Corp., 14860 Wicks Blvd., San Leandro, CA 94577, (415) 483-2093.

CIRCLE INQUIRY NO. 256

## S-100 Card Holds and Programs 2716, 2708 PROMs

The DATABANK PROM programming and storage board holds a maximum of eight TMS 2716 or 2708 PROMs (16K or 8K bytes). The board will also program PROMs via two special sockets.



One of these sockets provides a connection to an external programming station while the other socket allows the programming of PROMs on the DATABANK. Each of the eight PROMs may be individually switched into or out of the system address space. In addition, the entire board can be disabled and enabled by I/O commands.

The board is available in kit form with or without RAM. For prices and further information contact Objective Design, Inc., P.O. Box 20325, Tallahassee, FL 32304, (904) 224-5545.

CIRCLE INQUIRY NO. 257

## 8K RAM - 8K ROM Specification

RAM portion uses 8K of 21L02 RAMs for proven reliability and low power. ROM portion takes 2708 EPROMs for up to 8K of PROM. RAM and ROM are each independently addressable in 8K blocks.

Wait state select of 0 or 1 for ROM allows board to be used on 4 MHz Z80s. ROM can be switched out, if not used, to conserve address space. All address lines are fully buffered to reduce loading.

Schmitt trigger bus drivers are used to increase noise margin and reliability. Board is glass epoxy with solder mask and gold connector. S-100 compatible, 5.5" x 10".

Prices for raw boards are \$37.50 retail, \$32.00 for 5-24; \$28.00 for 25-99; \$25.00 for

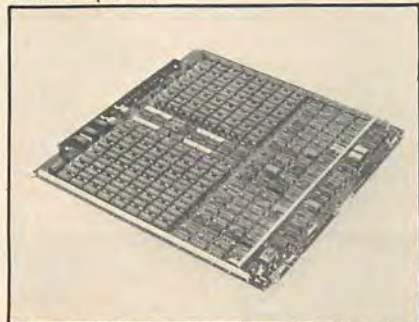
100-249; and \$22.50 for over 250. Assembled and tested retail price is \$195.00; \$175 for 5-24 and \$150 for 25-99. Quantities over 100 quoted. Delivery is 0-2 weeks for small quantities and 3-4 weeks for large quantities.

For more information contact TriMark Engineering, 12402 W. Kingsgate, Knoxville, TN 37922.

CIRCLE INQUIRY NO. 261

## Quadruple Density Nova 3 Add-In Memory

A new 256K byte single-board add-in memory for Nova 3 and 3/D computers supplies the maximum addressable memory in just one card slot, allowing additional slots in the chassis to be used for input/output boards or other options.



The 256K byte boards are also available in 128K by 17 bit even or odd parity, or 128K by 16 bit nonparity versions. Depopulated versions of the same board supply 192K bytes and 128K bytes, with and without ECC or parity options.

The add-in memory is completely compatible with Nova hardware, software and standard peripherals. No special tools or adjustments are required to install and operate the memory. The boards are priced from \$3,515 to \$11,025, depending on word length capacity, options and quantity. Delivery is 4 weeks ARO. For more information contact National Semiconductor Corp., Computer Products Group, 2900 Semiconductor Dr., Santa Clara, CA 95051; (408) 737-5700.

CIRCLE INQUIRY NO. 258

## Expandapet

The Expandapet is a complete expansion system for the Commodore PET or other 6502-based computer. It provides in one convenient assembly which can be mounted inside the PET up to 32K of RAM, 4K of EPROM, two complete parallel I/O ports with handshake.

The unit contains its own DC power supply and sockets for three additional expansion modules such as Serial I/O Board, S-100 Driver Board or Experimenter's Board.

The standard unit, priced at \$435, comes ready-built and tested with 16K of RAM, sockets for 4K of EPROM, 2 parallel I/O ports and necessary cables and brackets to mount inside the PET. An adapter for the KIM is also available.

For more information contact Convenience Living Systems, 648 Sheraton Dr., Sunnyvale, CA 94087, (408) 733-0688.

CIRCLE INQUIRY NO. 446

## Wang Compatible Memory Cards

Two new Wang 2200 memory cards are an 8 kilobyte version for A, B or C models, and a 16 kilobyte memory card for T or S models.

Based on current 4K static technology, the memories run at full rated speed. No special modifications are required to use them, as they are a functional replacement for Wang's own cards.

Pricing for the T and S versions are \$1495, and \$995 for A, B and C versions. For more information contact Digimates, Inc., Box 593, Littleton, CO 80120, (303) 733-1377.

CIRCLE INQUIRY NO. 253

## APPLE II SOFTWARE AT A-VIDD

### General Ledger On Apple Disk

This general ledger package includes accounts payable, sales and cash summary.

This is a disk based system which allows searches by invoice number, name or date. Requires Applesoft II.

Introductory price **\$60.00** on diskette.

### FORTH Language for Apple

A-VIDD now has the compiler language FORTH by Programma Consultants for the Apple II. FORTH has predefined words in its dictionary. Writing FORTH programs entails expanding the dictionary by adding new words which are made up linked words already in the dictionary or machine language instructions. This is an easily learned language which approaches assembly language speed.

On cassette with 25 page book, **\$35.00.**

### Text Processor For Apple

A-VIDD has in stock Applications Unlimited text editor for both cassette and disk based Apple II Systems. Allows upper and lower case characters and up to 255 characters per line on a printer. Editing functions include insert line, change line, delete line, find and replace all occurrences of a given string with another specified string. There is also a tab function which allows setting tabs in any number of columns. The text file can be saved to cassette or disk depending on the version.

Cassette version **\$50.00.** Disk version **\$60.00.**

### Other Apple Software

Appletalk speech synthesizer program **\$15.95**

Apple Checkbook program **\$20.00**

Apple Data Mover program for use with communications card **\$ 7.50**

Apple Dow Jones Package. Let your Apple talk to Wall Street **\$25.00**

Please add \$1 for postage and handling.

**A-VIDD**  
electronics co.

**2210 Bellflower  
Boulevard  
Long Beach, CA  
90815**

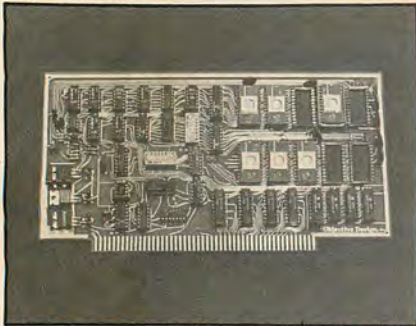
**(213) 598-0444**  
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CHARGE



### 16K Static RAM

SuperRam™ 16 is a 16K static memory board for S-100 microcomputer systems.

SuperRam 16 is a complete kit featuring four independently addressable and write-protectable 4K blocks.



The super-efficient design uses just eleven ICs to keep the board uncrowded and trouble-free. The board was designed to meet the proposed IEEE Standard for S-100, insuring full compatibility with all S-100 systems. All signals are fully buffered, including address and data lines.

SuperRam 16 retails for \$299. For more information contact Thinker Toys, 1201 Tenth St., Berkeley, CA 94710, (415) 524-5317, Neila Richmond.

CIRCLE INQUIRY NO. 260

### 4K x 1 Static RAMs

The MM5257 is produced in a variety of speeds, and in low power and standard versions. The new RAM is a pin-for-pin replacement for the TMS 4044.



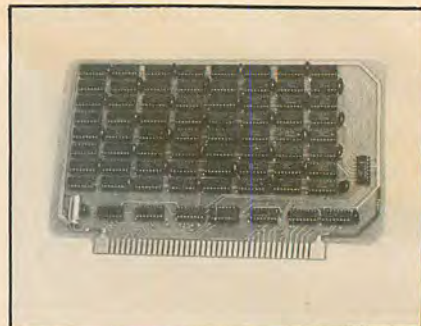
The 4K x 1 RAM requires a 5 volt power supply, and is available with a standard 450 ns access time (MM 5257), with a 300 ns access time (MM5257-3) and with a 250 ns access time (MM5257-25). The standard devices require a supply current of 90 mA, while the low power versions (MM5257L, -25L and -3L) require only 65 mA.

Prices in 100 up quantities range from \$9.65 to \$14.50. For more information contact National Semiconductor, 2900 Semiconductor Dr., Santa Clara, CA 95051, (408) 737-5000.

CIRCLE INQUIRY NO. 259

### 8K RAM Card

Audio Engineering has a competitively priced 8K RAM card for the Exorcisor™ bus. The unit features low power 2102 static RAMs, 450 ns access time, full address decoding jumper selectable to any 8K block, and can use VMA or VMA.



The unit is ideal for use with the MEK6800D2 kit. Single quantity pricing is \$159.00 for a complete kit, Catalog No. SY1-801K, \$229.00 assembled and tested, Catalog No. SY1-801, and \$34.90 for the bare board, Catalog No. PC-801. For more information contact Audio Engineering, 121 Wisconsin N.E., Albuquerque, NM 87108, (505) 255-6451.

CIRCLE INQUIRY NO. 442

## Test Equipment

### High-Speed Logic Troubleshooter

The Model 5700B Scanmaster allows rapid probing of the pins of IC modules by pushbuttons on the 5700B panel. Any pin can be probed within one second without counting and without making an individual connection to the pin.

The instrument includes a built-in dual-threshold high speed logic state analyzer that not only gives the logic information (Hi, Low, Pulse, Bad Level), but also catches and stores the static or dynamic failure on the fly. At the same time the instrument displays the pin number of the IC pin being probed.

The new Scanmaster is a combination of a pulser, logic-analyzing circuitry, a scanning system, memory, and a 3½ digit multi-range dc voltmeter.

Price is \$1,295. Delivery is 30 days. For more information contact Information Scan Technology, 1725 Rogers Ave., San Jose, CA 95112, (408) 292-7196, Tony Lee.

CIRCLE INQUIRY NO. 346

### Series A400 Counters-Timers

The Series A400 Counters-Timers are built around a single MOS IC. The unit offers 5 and 6 decades 0.3" or .6" LED readout, reversible, presettable, built-in digital comparator, zero detection, display hold, leading zero blanking, and other standard features.



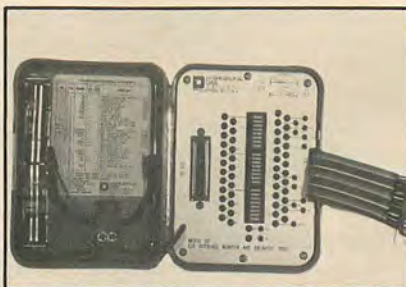
Some applications are frequency control, automatic stop, wire reeling, level control, automatic plotting, time control, batching, cutting, motor speed control, etc. The unit has provision for IMC's option card or customer's own proprietary designs.

Price is \$79 in single quantity for 6 decade Up/Down Counter. Availability is stock to 4 weeks. For complete information contact International Microtronics Corp., 4016 E. Tennessee St., Tucson, AZ 85714, (602) 748-7900, Dr. Otto Fest.

CIRCLE INQUIRY NO. 336

### Interface Monitor and Breakout Panel

The Model 60 is a pocket-sized, portable test set providing access to all 25 conductors of the EIA RS-232-C interface. Twenty-four switches allow all interface conductors (except frame ground) to be individually interrupted for simulating "handshaking" control signals and isolating terminal and modem signals.



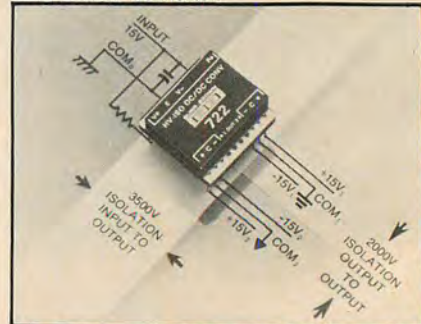
Twenty-five test points on each side of the breakout panel provide access to EIA signals for test equipment probes. Twelve LEDs display twelve key signals without interruption of signal path.

The Rechargeable Model 60 is priced at \$270. Delivery is 30 days ARO. For more information contact International Data Sciences, Inc., 100 Nashua St., Providence, RI 02904, (401) 274-1500, Marketing Dept.

CIRCLE INQUIRY NO. 337

### Isolated DC/DC Converter

A single 5VDC to 16VDC input is converted into a pair of isolated + and - outputs of the same value by Burr-Brown's new 722 Dual Isolated DC/DC Converter.



Complete system power and signal isolation is achieved when the 722 is combined with Burr-Brown's 3650 and 3652 optically coupled isolation amplifiers. The two output channels of the 722 are isolated from the input to 3500V continuous (8000V test). Channel to channel isolation is 2000V continuous and 5000V test. Output channels can be connected in series or in parallel to produce higher voltages or currents.

The 20-pin package is on standard DIP hole spacing. Price is \$30 for 1-24; \$24 for 25-99 and \$22 for 100-299. For more information contact Burr-Brown, International Airport Industrial Park, Tucson, AZ 85734, (602) 746-1111, Dennis Haynes, Product Manager.

CIRCLE INQUIRY NO. 333

### Low-Cost Dynamic Burn-In System

Designed and engineered for quality control, engineering evaluation and small manufacturing organizations, the System 1000A is a self-contained environmental life-test system. Program boards provide the user with flexibility to test up to three different types of semiconductor devices simultaneously.

The System 1000A is configured with a test-oven chamber, electronics module, control panel, power regulators, and an ambient test



## Double density Horizon Kit

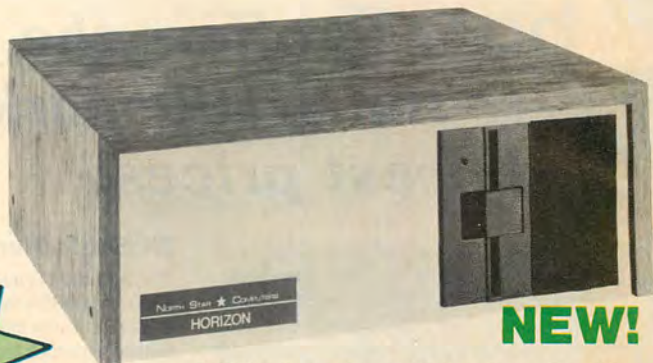
just announced . . . double the storage at the same price!

The best buy just got better. Now, Horizons are double density at the same price as single density. 180K bytes of on-line information per disk! Single density still runs on your new Horizon, or you can copy and convert all North Star software and programs to double density.

- 180K bytes per disk
- Z-80 processor
- 16K RAM
- add'l 16K memory, \$349
- add'l disk drive, \$349
- exclusive application software

**\$1349**

(reg. \$1599)



**NEW!**

Call for low assembled prices. Double density also available on North Star disk sub-system, \$599 kit.



**\$1995**

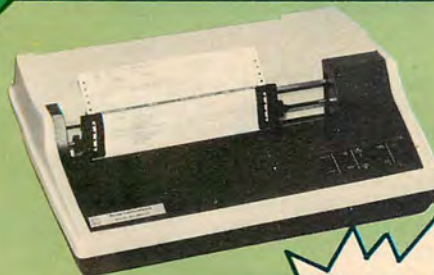
(reg. \$2495)

## LA 180 DECprinter with Serial Interface

immediate delivery on the field-proven performer

180 cps has never been so affordable. For a limited time, MicroWorld lowers the price of Digital's versatile medium speed printer. Reliable technology and an extensive array of human engineering features make the LA 180 the smart choice for local or remote business applications.

- 180 characters per second printing
- tractor feed with switchable forms length control
- upper/lower case & stand • compressed print, 16.5 characters per inch



**\$1695**

## Texas Instruments Impact Printer

immediate delivery

TI's new 810 multi-copy impact printer. Prints up to 440 lines per minute because of its unique look-ahead bi-directional feature, controlled by an on-board microprocessor.

- 150 cps, 110 to 9600 baud switchable
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- RS232 serial interface

## IP-125 Printer by Integral Data

**\$749**

(reg. \$799)



## More specials from stock

Soroc IQ 120/895 Terminal	\$ 895
TI 745 KSR Portable Terminal	\$1650
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DECwriter II	\$1495

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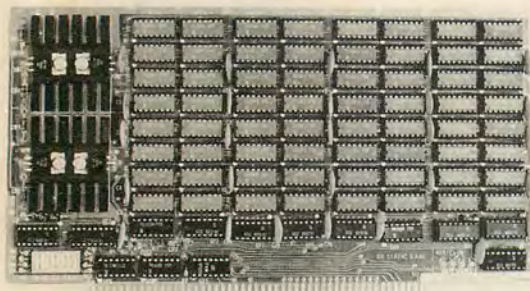
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MicroShopper Guide Vol. IV \$5.00 (includes \$1.05 postage)



# ? Wondering which memory is best for you?

**base 2. offers the following products to the S-100 market at the industry's lowest prices:**



## 8K Static Memory Board

This 8K board is available in two versions. The 8KS-B operates at 450ns for use with 8080 and 8080A microprocessor systems and Z-80 systems operating at 2MHz. The 8KS-Z operates at 250ns and is suitable for use with Z-80 systems operating at 4MHz. Both kits feature factory fresh 2102's (low power on 8KS-B) and includes sockets for all IC's. Support logic is low power Schottky to minimize power consumption. Address and data lines are fully buffered and 4K bank addressing is DIP switch selectable. Memory Protect/Unprotect, selectable wait states and battery backup are also designed into the board. Circuit boards are solder masked and silk-screened for ease of construction. These kits are the best memory value on the market! Available from stock . . .

**8KS-B \$125** (assembled and tested add \$25.00)

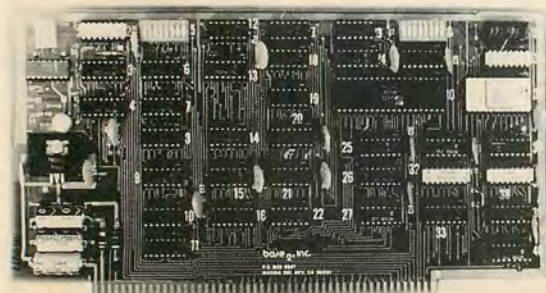
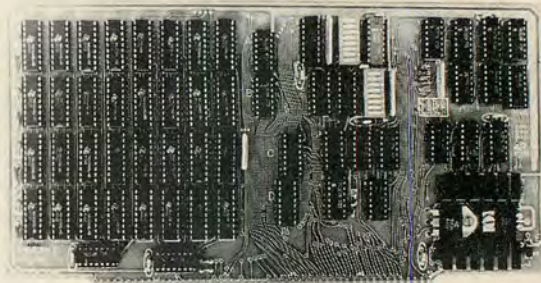
**8KS-Z \$145** (assembled and tested add \$25.00)

## 16K Static Memory Board

Base 2 can now offer the same price/performance in a 16K static RAM as in its popular 8K RAM. This kit includes 8K bank addressing with 4K boundary address setting on DIP switches. This low power unit provides on-board bank selection for unlimited expansion . . . No MUX board required. Using highest quality boards and components we expect this kit to be one of the most popular units on the market. Available in two speed ranges, the 16KS-B operates at 450ns while the 16KS-Z operates at 250ns.

**16KS-B \$285** (assembled and tested add \$25.00)

**16KS-Z \$325** (assembled and tested add \$25.00)



## Z-80 CPU Board

Our Z-80 card is also offered in two speed ranges. The CPZ-1 operates at 2MHz and the CPZ-2 operates at 4MHz. These cards offer the maximum in versatility at unbelievably low cost. A socket is included on the board for a 2708 EPROM which is addressable to any 4K boundary above 32K. The power-on jump feature can be selected to address any 4K boundary above 32K or the on-board 2708. An On-board run-stop flip-flop and optional generation of Memory Write allows the board to run with or without a front panel. The board can be selected to run in either the 8080 mode, to take advantage of existing software, or in the Z-80 mode for maximum efficiency. For use in existing systems, a wait state may be added to the M1 cycle, Memory request cycle, on-board ROM cycle, input cycle and output cycle. DMA grant tri-states all signals from the processor board. All this and more on top quality PC boards, fully socketed with fresh IC's. **CPZ-1 \$110 CPZ-2 \$125**

## S-100 for Digital Group Systems

This kit offers, at long last, the ability to take advantage of S-100 products within your existing Digital Group mainframe. Once installed, up to four S-100 boards can be used in addition to the existing boards in the D.G. system. The system includes an "intelligent" mother board, ribbon cables to link existing D.G. CPU to the DGS-100 board and a power wiring harness. The DGS-100 is designed to fit in the 5-3/4" x 12" empty area in the standard D.G. cabinet. It may seem expensive but there's a lot here! End your frustration! **DGS-100 \$295**



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console. The chamber, divided into three functionally independent zones, accepts two burn-



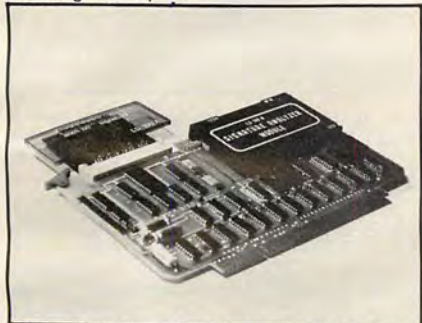
in boards per zone, and holds up to 1,000 devices. The chamber also contains temperature control and alarm system.

Base price of the System 1000A is \$14K. For more information contact Microtest Systems, Inc., 1188 Bordeaux Dr., Sunnyvale, CA 94086, (408) 745-7000, Arnold Becker.

CIRCLE INQUIRY NO. 338

### Signature Analysis

LS-100 Series Digital Signature Analysis product family provides the foundation for discrete, LSI and microprocessor circuit troubleshooting and repair.



Verification of correct digital patterns provides GO/NO-GO testing as well as diagnostics. 99.99% error detection accuracy: rapid identification of bad components, PC boards and entire systems becomes reality.

Options include remote LED Signature Display, 32 line multiplexer, logic probes, enhanced software package and stand alone test ability.

LS-100 expandable series is available in S-100, LSI-11, EXORciser bus compatible plug-ins, ready to go, priced from \$295. Delivery is 30 days. For more information contact Phoenix Digital Corp., P.O. Box 11628, Phoenix, AZ 85017, (602) 996-8262.

CIRCLE INQUIRY NO. 341

### Logic State Analyzer

The 32-channel Model 532 Intelligent Logic State Analyzer is capable of programming itself for automatic operation.

Using an Auxiliary Memory Board which plugs directly into the analyzer's internal bus, the Model 532 can store 8 individual tests: one in RAM and seven in UV PROMs.



In practice, the analyzer is connected to a known good system and the conditions for triggering are programmed into the Model 532 using its keyboard. With the known good system operating and the triggering conditions satis-



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CIRCLE INQUIRY NO. 91

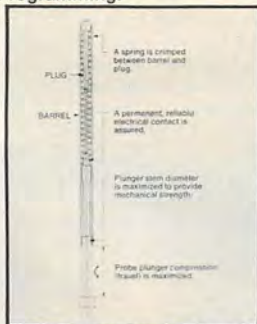
fied, a full 32-bit by 250-word set of data is collected by the analyzer's main memory. Then, in order to identify this collection, a data compression algorithm operating on main memory contents computes a representative hexadecimal signature.

Base price for the Model 531 is \$1,500. Delivery is 6 weeks. For more information contact Paratronics, Inc., 800 Charcot Ave., San Jose, CA 95131, (408) 263-2252.

CIRCLE INQUIRY NO. 339

### Spring-Loaded Test Probes

A full line of replaceable spring probes and sockets to assure maximum reliability for circuit testing is available from Electronic Systems & Programming.



Probe design features a spring which is crimped between the barrel and plug to provide a permanent electrical contact. They are ideal for use where exacting electrical testing is required.

Sockets are available in three styles: crimp, wire wrap and solder cup termination. Features a bulge in one end to assure retention in probe block material, and up to 8 barrel detents to insure reliable captivation of the spring probe. Eliminates degradation in probe retention after repeated insertions and extractions.

For more information contact Electronic Systems & Programming, 12901 Crenshaw Blvd., Hawthorne, CA 90250, (213) 973-0262, Karl Zimmermann.

CIRCLE INQUIRY NO. 340

### Burst Capability Added to SPG-800 Programmable Generator

The addition of a burst count option to Interstate's SPG-800 programmable generator allows a selected number of test cycles from 1 to 19,999. The new option provides a more efficient testing capability in automatic test equipment (ATE) systems and general manufacturing/lab use.



The SPG-800 programmable generator already combines four different programmable instrument functions into one unit: function generator, pulse generator, frequency synthesizer, and d-c voltage source. The addition of the burst option expands the generator's overall capability and versatility in signal source test instruments.

The burst option is priced at \$695 with 15-day delivery. For more information contact Interstate Electronics Corp., P.O. Box 3117, Anaheim, CA 92803, (714) 635-7120.

CIRCLE INQUIRY NO. 344



## 50 MHz Counter

The Mini-Max Counter comes in a small calculator-style case with 50MHz guaranteed performance. It features a 6-digit magnified LED display with 100 Hz resolution. Decimal points after the second and fifth digits act as pilot lights and indicate MHz and KHz points on the display.



The counter display updates ten times per second. A UHF FET preamplifier provides very capable weak-signal performance, permitting the Mini-Max to be driven directly from an optional accessory whip antenna.

Suggested resale price is \$89.95. For additional information contact Continental Specialties Corp., 70 Fulton Terrace, New Haven, CT 06509, (203) 624-3103.

CIRCLE INQUIRY NO. 343

## New Probe Adaptor for Logic Analyzer Data Acquisition

For more convenient data acquisition to the 7D01 and LA 501 Logic Analyzers, Tektronix now offers a new accessory for its P6451 active probe.

A ten-lead comb that plugs into the P6451 in lieu of the individual grabber clips has a ten-wide harmonica adaptor for data acquisition. This harmonica adaptor connects to as many as ten square pins spaced at  $\frac{1}{16}$  of an inch.

The 7D01 and LA 501 Logic Analyzers use two P6451 probes for a total of 18 inputs — 16



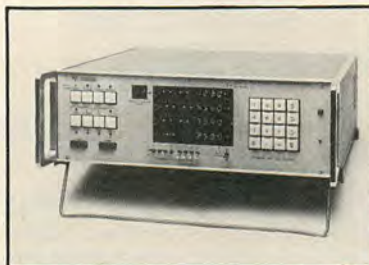
data input channels, one clock input, and one qualifier input — plus a ground lead for each probe.

The ten-wide comb with harmonica adaptor is priced at \$25. For more information contact Tektronix, Logic Development Products, P.O. Box 500, Beaverton, OR 97077, (503) 644-0161.

CIRCLE INQUIRY NO. 342

## Digital Synthesizer Analyzer

The Gould DSA600 is a test instrument for the analysis and synthesis of digital waveforms. The new processor-based digital synthesizer analyzer offers significant advantages in application flexibility and accuracy over conventional logic analyzers, particularly for digital signals containing widely differing time ranges.



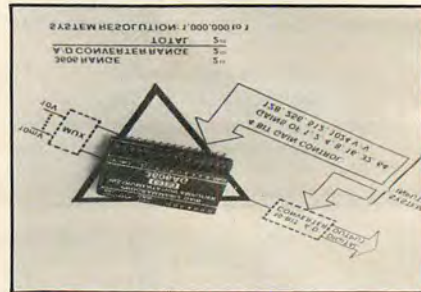
The DSA600 differs from conventional oscilloscope-based instruments such as logic analyzers by using a state-linear rather than a time-linear presentation.

Price for the DSA600 is \$6,250; delivery is 90 days ARO. The unit carries a 2-year warranty. For more information contact Gould Inc., Instruments Div., 3631 Perkins Ave., Cleveland, OH 44114, (216) 361-3315, Marketing Services.

CIRCLE INQUIRY NO. 330

## Programmable Gain Instrumentation Amplifier

Burr-Brown's new 3606 Programmable Gain Instrumentation Amplifier offers 11 binary gains selected by a 4-bit TTL word. The PGIA function allows the 3606 to be used with wide dynamic range signals while maintaining high system accuracy.



A unique design approach, plus precise laser trimming of stable thin-film resistor networks, limits change in offset voltage — without external adjustments — to  $\pm 25\text{mV}$  max for any gain change. With two simple offset adjustments, the change is limited to less than  $\pm 2\text{mV}$ .

Priced, in 100's, as low as \$51.50 in ceramic, \$70.00 in metal. For more information contact Burr-Brown, P.O. Box 11400, International Airport Industrial Park, Tucson, AZ 85734, (602) 746-1111, Dennis Haynes, Product Manager.

CIRCLE INQUIRY NO. 331

# Power Supplies

## Switcher Price Reduction

Prices have been reduced on Elpac Power Systems switch mode power supplies an average of 20% in single unit quantities. The EPS175 3 output switcher has been reduced from \$383 to \$299.



The EPS180 4 output switcher has been reduced from \$399 to \$312. The two single output switchers have also been reduced in the single unit category. The EPS100 has been reduced from \$275 to \$220, and the EPS 250 was reduced from \$387 to \$349.

Over-voltage protection, remote sense, and isolated floating outputs are standard features in all models, as well as 110/220 input.

For more information contact Elpac Power Systems, 3131 So. Standard Ave., Santa Ana, CA 92705, (714) 979-4440.

CIRCLE INQUIRY NO. 373

## Power Supply Transformers

The Transformer Division of Abbot Transistor Labs has developed a new line of power supply transformers designed specifically for use with the most popular three terminal IC voltage regulators in low-cost AC to low voltage DC isolated power supplies.



With the new 6PS series transformers Abbot also provides the schematic and list of recommended components required to build the complete power supply. All listed components, including the Abbott transformer, are printed circuit board compatible.

Models have a range of outputs and prices start at \$5.10 in 1-9 quantities. For more information contact Abbott Transistor Labs, Inc., Transformer Div., 639 S. Glenwood Pl., Burbank, CA 91506, (213) 841-3630.

CIRCLE INQUIRY NO. 374

## DA200 Series Power Modules

The DA200 series of high efficiency switching regulated power modules are designed specifically for computer and computer peripheral applications. Each unit is operable from user selectable inputs of 115 VAC  $\pm 10\%$  single phase or three phase Wye, or 230 VAC  $\pm 20\%$  single phase or three phase Delta.





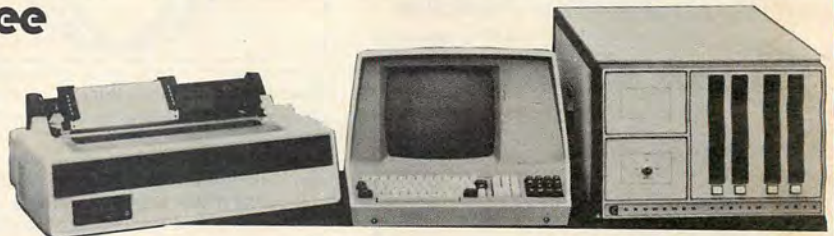
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## Cromemco System Three

Factory integrated Z80 computer with 512K 8" dual disk drives, 32K memory, CRT terminal with editing and block mode, and high speed line printer. CP/M, CBASIC, word processing and many business application packages available at additional charge.

Factory list ~~\$10,980~~

Your cost \$9663!



## Vector MZ

Factory assembled Z80 computer with 630K dual 5" disk drives, 32K memory, 1K PROM monitor, and Micropolis extended Disk BASIC. We add Centronics 779 printer and Hazeltine 1500 CRT terminal. CP/M, CBASIC, word processing and many business application packages available at additional cost.

Factory list ~~\$6,380~~

Your cost \$5,774!



## North Star HORIZON-2

Factory assembled Z80A computer with 180K dual 5" disk drives, 32K RAM memory, with all I/O ports and connectors installed. Complete with North Star Disk BASIC, Hazeltine 1500 CRT terminal and Centronics 779 printer. CP/M, CBASIC, word processing and many business packages available at additional charge.

Factory list ~~\$5,605~~

Your cost \$5,147!



## Apple II

Delivered with Apple's new DISK II, 32K memory and RF Modulator for color television hookup. Apple Disk BASIC included. Optional software includes Stock Market Portfolio analysis, business applications, telephone communications and high resolution graphics.

Factory list ~~\$2,120~~

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We can supply the best software available on the market today to work with all of the computer systems we sell. Prices range from \$100 to \$1000 and include packages developed by Structured Systems Group, Compumax, Serendipity, and Grimes. Applications available include:

- ★General Ledger ★Accounts Receivable ★Accounts Payable ★
- ★Inventory ★Payroll ★Order Entry ★Mail List ★
- ★Word Processing ★

# Sunshine Computer Company

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Three units are available with outputs of 5 VDC,  $\pm 12$  VDC and  $\pm 15$  VDC with total power of 200 watts. Full power is available at ambient temperatures of 35°C with 50% derating at 71°C.

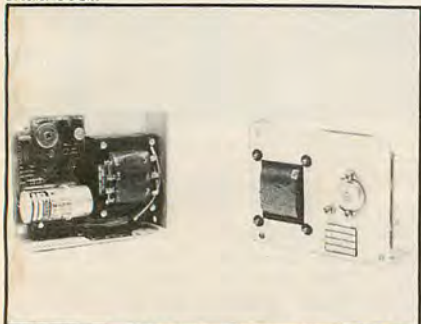
Other series in this new line include 50 and 100 watt output units plus 41 to 52 VDC input models at 50, 100 and 150 watts output.

Price is \$395 for unit quantities. Delivery is stock to 10 weeks. For more information contact Abbott Transistor Laboratories, Inc., 5200 W. Jefferson Blvd., Los Angeles, CA 90016, (213) 936-8185, James Bell.

CIRCLE INQUIRY NO. 376

### Low Voltage Power Supply Now Includes Overvoltage Protection

The 5 volt 3 amp Model EC5N3B open-frame power supply is now available with overvoltage protection as a standard feature at no extra cost.



Packaged in an "A" size case, the single output supply operates on an input voltage of 105-125/210-250 VAC, 47 to 63 Hz. Regulation is 0.1% + 5mV, NL-FL; ripple is specified at 2mV RMS maximum, 20mV peak-to-peak maximum.

In quantities of 1-9, the unit is priced at \$24.50 each. Delivery is from stock. OEM quantity prices quoted on request. For more information contact ACDC Electronics, Div. of Emerson Electric Co., 401 Jones Rd., Ocean-side, CA 92054, (714) 757-1880, Bob Hecton.

CIRCLE INQUIRY NO. 369

### Power Supply Controller IC

The TL406C controller can provide a 9 volt regulated system supply from a transformer-coupled AC input or a two-cell battery standby source.



In addition to the regular function, the TL406C also allows batteries to be recharged through one external diode when operating on the transformer-coupled source.

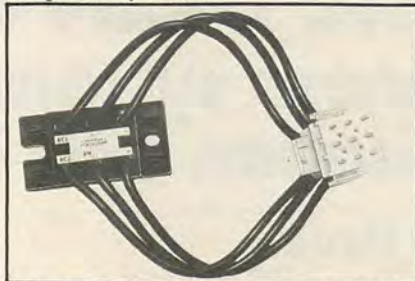
A monolithic IC, the TL406C contains a voltage reference, pulse generator and timing circuitry, error amplifier, blocking diode and an output switching transistor. The switching transistor enables the switching regulator to step-up the battery voltage to the required 9 volts out.

Prices in 100-piece quantities are \$0.66 for the TL406CP (plastic) and \$0.94 for the TL406C-JG (ceramic). For more information contact Texas Instruments Inc., IAS, P.O. Box 5012, M/S 308 (Attn: TL406C), Dallas, TX 75222, (214) 238-5908, Dale Pippenger.

CIRCLE INQUIRY NO. 375

### SCRs

The BW series of Powertherm SCR and diode bridge circuits are rated to 25 amps, sufficient to phase control a two horsepower motor. The number of thermal resistance paths is significantly reduced.



The ceramic interfaces directly with the heat sink mount surface. Junction temperatures have been measured to be 10°C less than units with metal heat plates.

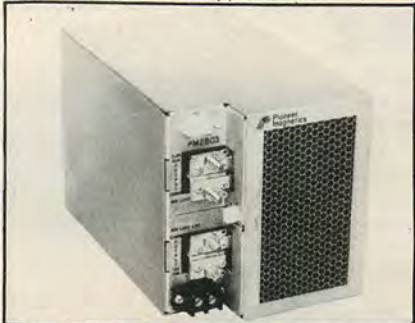
Internal connections to chips use the patented Powertherm Process for the fewest number of bonds. The BW series package has a 6-inch wire lead that can terminate in a single molded socket as an additional option.

A typical BW series unit with 2 SCRs and 3 diodes sells for \$9 in for 1,000. Units are available from stock. For more information contact Gentron Corp., 6667 N. Sidney Pl., Milwaukee, WI 53209, (414) 351-1660, Lance Kaufman.

CIRCLE INQUIRY NO. 370

### Multiple Output Switching Power Supplies

Pioneer Magnetics has a new family of high power multiple-output switching power supplies for powering a wide variety of computer and electronic control applications.



Designated the PM2803, the new multiple has power levels of up to 1150 watts. It provides regulated output at full load over input voltage ranges of 184 to 250 VAC.

Standard features include overload, short circuit, reverse voltage protection on each output, automatic overtemperature shutdown and overvoltage protection on the main channel. Remote sensing to compensate for voltage drops in the output lines is also standard on all channels.

For more information contact Pioneer Magnetics, Inc., 1745 Berkeley St., Santa Monica, CA 90404, (213) 829-6751, Arnold Haglwa.

CIRCLE INQUIRY NO. 368

### Switching Regulator Power Supply

The SPU series switch regulated power supplies are designed to match the critical needs of CRT terminals. The supplies are designed with low field leakage and optional synchronized input for minimal video disturbance.

A wide range of voltages in multiple outputs are available. For example, the model SPU-5-15/15 delivers +5, +15 and -15 VDC at 200 watts continuous duty. Remote sensing on all outputs assures 0.1% regulation from no load to full load with ripple and noise less than 50 mv P-P on all outputs. Complete electrical and thermal protection is provided for short, overload and overvoltage conditions.

For application flexibility, the SPU series has  $\pm 5\%$  voltage adjustments on all outputs, switch selected 110 or 220 VAC inputs, and standard terminal or customer specified I/O connectors. Modular packaging concept permits changes in outline dimensions.

For further information contact Dynetic Systems Corp., 19128 Industrial Blvd., Elk River, MN 55330, (612) 441-4300, William Sadler.

CIRCLE INQUIRY NO. 367

### Three-Output Switching Power Supplies from Gould

Two new three-output switching power supplies are designed from Gould's standard MG technology for applications in the telecommunications industry.



The MGT-400 power supply delivers 400 watts from either a 110 or 220 line and operates from 47 to 440 Hz.

The unit is designed for high-power microprocessor applications requiring large amounts of memory and logic around the microprocessor.

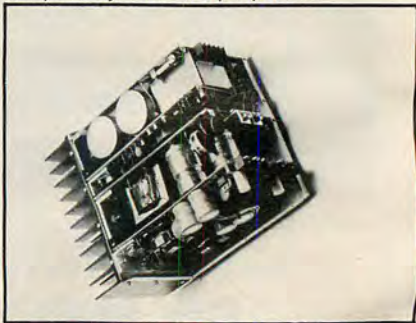
The MGT-250 switching power supply features almost unlimited DC input flexibility, designed for operation from 24 or 48 volt supplies without adjustment over a continuous range of 21 to 56 volts.

The MGT-400 price is \$535 and the MGT-250 is \$750 in 100-piece quantities. For more information contact Gould's Electronic Components Div., 4601 N. Arden Dr., El Monte, CA 91731, (213) 442-7755.

CIRCLE INQUIRY NO. 365

### Sub-Modular Switching Power Supplies

A line of high-performance, single- and triple-output switching-regulated power supplies are designed for minicomputers, micro-computer systems and peripherals.



Designated the Sub-Modular Switcher Series, the 50 to 300 watt supplies incorporate a new design philosophy based on the use of large-scale integration (LSI) control circuits mounted on printed circuit boards to form standard modular subassemblies. Each sub-assembly performs separate, distinct functions within the supply itself.

Single output switchers priced at \$399 and triple output priced at \$575. Delivery is 4 weeks. For more information contact ACDC Electronics, Div. of Emerson Electric Co., 401 Jones Rd., Oceanside, CA 92054, (714) 757-1880, Bob Hecton.

CIRCLE INQUIRY NO. 366



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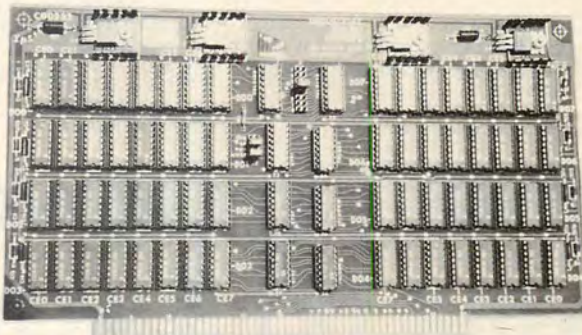
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(714) 898-8330

3808 Verdugo Ave., Burbank, CA 91505  
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CLOSED SUNDAYS AND MONDAYS



# Components

## New Multiplier-Accumulator

A monolithic multiplier-accumulator has 120 nsec for 16 by 16-bit performance. The new TDC1010J can be used as a multiplier or multiplier-accumulator and provides controllable addition or subtraction in a 35-bit accumulator-subtractor.

The chip contains input registers as well as accumulation registers on the output. A round control is provided in the 2's complement or

unsigned magnitude multiplier. Inputs and outputs are TTL compatible. Three state outputs are standard.

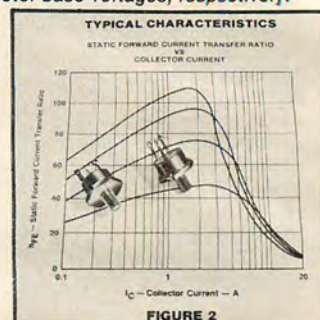
The TDC1010J comes in a 64-pin dual-in-line package. It operates from a 5V supply, with a power consumption of 3.5W.

Price in quantities of 100-499 is \$205. Delivery is from stock. For more information contact TRW LSI Products, P.O. Box 1125, Redondo Beach, CA 90278, (213) 535-1831.

CIRCLE INQUIRY NO. 115

## 300V, 20A NPN Power Transistor Exhibits Gain to 200

Two new multiple epitaxial NPN power transistors from Solid State Devices, the 150W 2N3846 and 2N3847 have 200V and 300V collector-emitter voltages and 300V and 400V collector-base voltages, respectively.



For both devices, maximum emitter-base voltage is 10V while maximum continuous collector current is 20A and continuous base current is 10A.

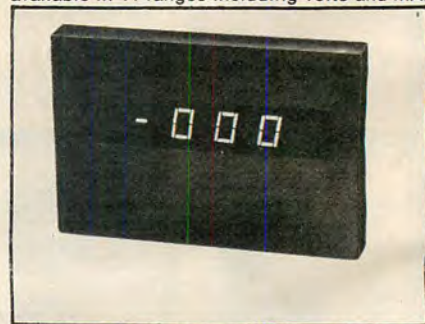
The maximum static-forward-current transfer ratio is 200 and a minimum of 40 with a 5A collector current.

Housed in TO63 packages, the 2N3846 power transistors are priced at 40¢ each and the 2N3847 are \$50 each in 100 to 999 quantities. For more information contact Solid State Devices, Inc., 14830 Valley View Ave., La Mirada, CA 90638, (213) 921-9660.

CIRCLE INQUIRY NO. 114

## LED DPM Goes Flat Pack

The F500 series is IMC's new line of "No Tools" DPM, containing only one IC and 16 passive components. It weighs less than 2 ounces, consumes 800mW at 5 VDC and is available in 11 ranges including volts and mA.



Either front or rear mount is easily done with the high strength, double-sided tape furnished with the unit. All that is required is a 1/4" diameter hole, pass wires through, apply tape, make connections and apply power. 3 1/2 red LED 0.3" high, differential, single ended, 50mV through 500V and 200uA through 200mA are the input ranges.

Single unit price is \$49 and \$38 in 100's. Delivery is stock to 4 weeks. For complete data contact International Microtronics Corp., 4016 E. Tennessee St., Tucson, AZ 85714, (602) 748-7900, Dr. Otto Fest.

CIRCLE INQUIRY NO. 128

## Flat Pack 6 Digit Up/Down Counter

The Series F400 Flat Pack Up/Down Counter/Totalizers feature single MOS IC operation, 6 full decades, 12V high noise logic, 0.3" LED, synchronous up/down count for easy interface with bidirectional encoders, display hold, zero and carry detect, leading zero blanking, 1MHz

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# Rockwell AIM 65

## The Head-Start in Computers

### AIM 65 Technical Overview

#### THERMAL PRINTER

Most desired feature on low-cost microcomputer systems...

- Wide 20-column printout
- Versatile 5 x 7 dot matrix format
- Complete 64-character ASCII alphanumeric format
- Fast 120 lines per minute
- Quiet thermal operation
- Proven reliability

#### FULL-SIZE ALPHANUMERIC KEYBOARD

Provides compatibility with system terminals...

- Standard 54 key, terminal-style layout
- 26 alphabetic characters
- 10 numeric characters
- 22 special characters
- 9 control functions
- 3 user-defined functions

#### TRUE ALPHANUMERIC DISPLAY

Provides legible and lengthy display...

- 20 characters wide
- 16-segment characters
- High contrast monolithic characters
- Complete 64-character ASCII alphanumeric format

#### PROVEN R6500 MICROCOMPUTER SYSTEM DEVICES

Reliable, high performance NMOS technology...

- R6502 Central Processing Unit (CPU), operating at 1 MHz
- Has 65K address capability, 13 addressing modes and true index capability. Simple, but powerful 56 instructions.
- Read/Write Memory, using R2114 Static RAM devices. Available in 1K byte and 4K byte versions.
- 8K Monitor Program Memory, using R2332 Static ROM devices. Has sockets to accept additional 2332 ROM or 2532 PROM devices, to expand on-board Program Memory up to 20K bytes.
- R6532 RAM-Input/Output-Timer (RIOT) combination device. Multipurpose circuit for AIM 65 Monitor functions.
- Two R6522 Versatile Interface Adapter (VIA) devices, which support AIM 65 and user functions. Each VIA has two parallel and one serial 8-bit, bidirectional I/O ports, two 2-bit peripheral handshake control lines and two fully-programmable 16-bit interval timer/event counters.

#### BUILT-IN EXPANSION CAPABILITY

- 44-Pin Application Connector for peripheral add-ons
- 44-Pin Expansion Connector has full system bus
- Both connectors are KIM-1 compatible

#### TTY AND AUDIO CASSETTE INTERFACES

- Standard interface to low-cost peripherals...
- 20 ma. current loop TTY interface
- Interface for two audio cassette recorders
- Two audio cassette formats: ASCII KIM-1 compatible and binary, blocked file assembler compatible

#### ROM-RESIDENT ADVANCED INTERACTIVE MONITOR

Advanced features found only on larger systems...

- Monitor-generated prompts
- Single keystroke commands
- Address independent data entry
- Debug aids
- Error messages
- Option and user interface linkage

#### ADVANCED INTERFACE MONITOR

##### COMMANDS

##### Major Function Entry

- (RESET Button)—Enter and initialize Monitor
- ESC—Re-enter Monitor
- E—Enter and initialize Text Editor
- T—Re-enter Text Editor
- N—Enter Assembler
- 5—Enter and initialize BASIC Interpreter
- 6—Re-enter BASIC Interpreter

##### Instruction Entry and Disassembly

- I—Enter mnemonic instruction entry mode
- K—Disassemble memory

##### Display/Alter Registers and Memory

- \*—Alter Program Counter to (address)
- A—Alter Accumulator to (byte)
- X—Alter X Register to (byte)
- Y—Alter Y Register to (byte)
- P—Alter Processor Status to (byte)
- S—Alter Stack Pointer to (byte)
- R—Display all registers
- M—Displays four memory locations, starting at (address)
- (SPACE)—Display next four memory locations
- Alter current memory location

##### Manipulate Breakpoints

- #—Clear all breakpoints
- 4—Toggle breakpoint enable on/off
- B—Set one to four breakpoint addresses
- ?—Display breakpoint addresses

##### Control Instruction/Trace

- G—Execute user's program
- Z—Toggle instruction trace mode on/off
- V—Toggle register trace mode on/off
- H—Trace Program Counter history

##### Control Peripheral Devices

- L—Load object code into memory from peripheral I/O device
- D—Dump object code to peripheral I/O device
- 1—Toggle Tape 1 control on/off
- 2—Toggle Tape 2 control on/off
- 3—Verify tape checksum
- CTRL PRINT—Toggle Printer on/off
- LF—Line Feed
- PRINT—Print Display contents

##### Call User-Defined Functions

- F1—Call User Function 1
- F2—Call User Function 2
- F3—Call User Function 3

##### Text Editor Commands

- R—Read lines into text buffer from peripheral I/O device
- I—Insert line into text buffer from Keyboard
- K—Delete current line of text
- (SPACE)—Display current line of text
- L—List lines of text to peripheral I/O device
- U—Move up one line
- D—Move down one line
- T—Go to top line of text
- B—Go to bottom line of text
- F—Find character string
- C—Change character string
- Q—Quit Text Editor, return to Monitor

##### LOW COST PLUG-IN ROM OPTIONS

- 4K Assembler—symbolic, two-pass
- 8K BASIC Interpreter

##### POWER SUPPLY SPECIFICATIONS

- 5 VDC ± 5% regulated @ 2.0 amps (max)
- +24 VDC ± 13% unregulated @ 2.5 amps (peak)
- 0.5 amps (average)

AIM 65 (1K) \$375.00 (\$15.00)

AIM 65 (4K) \$450.00 (\$15.00)

Assembler ROM—Add \$85.00

BASIC Interpreter—Add \$100.00

Power Supply—Add \$45.00

\*Shipping and handling charge.

Calif. residents add 6% sales tax.



Rockwell's AIM 65 Advanced Interactive Microcomputer can get you into the exciting world of microcomputers a lot easier and at a lower cost than you may have thought possible. And you'll be working with the 6500 family, the advanced state-of-the-art NMOS system that's an ever-increasing favorite for new commercial and hobbyist applications.

As a learning aid, AIM 65 gives you an assembled, versatile microcomputer system with a fullsize keyboard, 20-character display and, uniquely, a thermal printer. An on-board Advanced Interactive Monitor program provides extensive control and program development functions. And our AIM 65 User's Manual will help you along each step of the way.

You'll master fundamentals rapidly. Then you'll appreciate the fact that unlike the computer "toys" on the market, AIM 65 offers flexibility and expandability you would expect to find in a sophisticated microcomputer development system.

#### THERMAL PRINTER GIVES YOU HARD COPY—FAST AND QUIET.

AIM 65's 20-column Thermal Printer prints on low-cost, thermal roll paper at a fast 120 lines per minute. It produces all of the standard 64 ASCII characters with a crisp-printing five-by-seven dot matrix. AIM 65's on-board printer is a unique feature for a low-cost computer.

#### EXTENDED ALPHANUMERIC DISPLAY IS BUILT FOR UNDERSTANDING, NOT DECIPHERING.

AIM 65 comes with a 20-character true Alphanumeric Display. Information is displayed with bright, magnified 16-segment font monolithic characters. It's both unambiguous and easily readable.

#### FULL-SIZE KEYBOARD IS DESIGNED FOR HUMANS, NOT ELVES.

AIM 65's terminal-style keyboard frees you from the hassles of fumbling around with a tiny calculator-type keypad. And its 54 keys provide 70 different alphabetic, numeric, control and special functions.

#### ON-BOARD ADVANCED INTERACTIVE MONITOR GETS YOUR PROGRAMS UP AND RUNNING.

The ROM-resident AIM 65 Advanced Interactive Monitor Program provides a comprehensive set of easy-to-use, single-keystroke commands for debugging your programs, and offers features normally available only in large, expensive microcomputer development systems. And with the AIM 65 Monitor, there's no guesswork involved; the Monitor gives a self-explanatory prompt when it needs information and it will generate a meaningful error message if an error has occurred.

The AIM 65 Monitor includes commands to

- Enter and edit programs directly—no "opcode" memorization
- List programs on Printer or TTY
- Display/alter registers and memory
- Set breakpoints, trace and debug program execution
- Control the Thermal Printer
- Transfer information to/from attached Cassette Recorders or TTY
- Execute programs in on-board or external RAM, ROM or PROM memory
- Interface the optional AIM 65 Assembler and BASIC Interpreter

#### AIM 65'S ADVANCED R6500 NMOS ARCHITECTURE.

The R6502 Central Processing Unit is the heart of the AIM 65. It provides demonstrated speed and simplicity, plus 65K addressability and the power of a 56-command, minicomputer-like instruction set.

The R6532 RAM-Input/Output-Timer (RIOT) combination device is used by the AIM 65 Monitor for scratchpad memory and Keyboard operations.

Two R6522 Versatile Interface Adapter (VIA) devices are provided. One device supports AIM 65's Thermal Printer and the TTY and Cassette Interfaces, the other supports two user-dedicated 8-line I/O ports, plus an 8-bit serial I/O port and access to two 16-bit interval timer/event counters, on the module's Application Connector.

AIM 65 comes with two R2332 4K Read Only Memory (ROM) devices installed. These hold the Advanced Interface Monitor program. Spare sockets allow the user to expand on-board ROM up to 20K bytes. These sockets will accept user programs on R2332 ROMs or compatible PROMs, or can be used to install the optional AIM 65 Assembler and BASIC Interpreter ROM devices.

On-Board Read/Write RAM memory is available in 1K-byte and 4K-byte configurations.

#### AIM 65 HAS EXPANSION BUILT IN.

And to allow AIM 65 to grow the way you want it to, we've provided an Application Connector and an Expansion Connector. The Application Connector permits you to plug on a TTY (20 ma. current loop) and one or two standard audio cassette recorders. It also has the pinouts for the VIA's General-Purpose I/O ports. The Expansion Connector extends AIM 65's system bus—address, data and control—out to additional memory, or anything else you might attach.

And, BASIC high-level language programming is a built-in option.

#### MONEY BACK GUARANTEE

If you are not convinced that the AIM 65 is the best of its kind on the market, we will refund your money immediately.

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MASTERCARD



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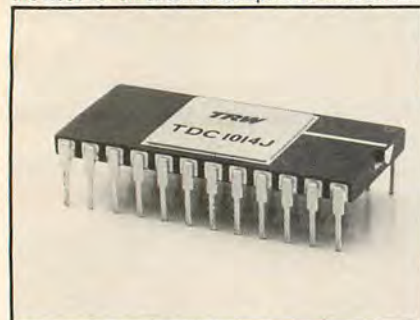
Due to low weight and small package the F400 can be attached to the panel by means of supplied double-sided stick-on tape, high strength glue or simple bracket.

Two versions are available: Wire connections and/or front controls. Single unit price is \$79 and \$60 in 100's. For complete information contact International Microtronics Corp., 4016 E. Tennessee St., Tucson, AZ 85714, (602) 748-7900, Dr. Otto Fest.

CIRCLE INQUIRY NO. 130

### New Video-Speed A/D Chip

The TDC 1014J is a low-cost, analog-to-digital converter chip that features 6-bit resolution and a 30MHz sample rate. Packaged in a 24-pin ceramic DIP, the bipolar LSI device consumes only 3/4 watt, yet provides high-performance video-speed data conversion without the need for an external sample-and-hold circuit.



Easy to use, the TDC 1014J requires only a single "convert" command to digitize an analog waveform between zero and -1V. On-chip are 63 strobed comparators, encoding logic and a 6-bit data latch with TTL outputs. Output-mode controls provide either straight binary or two's complement data.

Price is \$186 in quantities of 100. Delivery is off the shelf from Hamilton/Avnet. For more information contact TRW LSI Products, P.O. Box 1125, Redondo Beach, CA 90278, (213) 535-1831.

CIRCLE INQUIRY NO. 129

### Series NCS84 Modular Board

New I.C.-Pluggable Wire-Wrap Panels are available that provide three sets of 28 input/output terminals each per modular section. The new panels are available with nine universal columns, 50 contacts per column, up to 8 sections for a total of 72 universal columns.



The new panels are also available in 30 patterns per section, up to 8 sections for a total of

240 patterns with three sets of 28 input/output terminals per section.

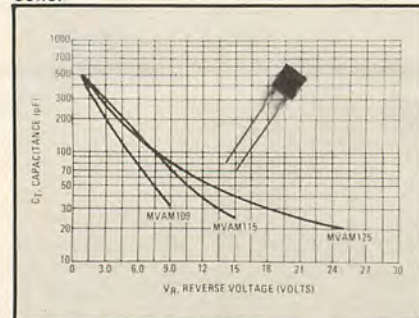
The NCS84 panels are supplied with precision screw machine I.C. Socket/Terminals, available for one-, two-, or three-level wire-wrap, with gold-over-nickel or tin plating. Socket spring clips are Beryllium copper gold plated. Voltage and Ground positions are available with hollow sockets or spring clips for convenient mounting of decoupling capacitors.

Prices range from \$2.00 to \$3.00 per IC position. Delivery is 2-4 weeks. For more information contact Garry Manufacturing Co., 1010 Jersey Ave., New Brunswick, NJ 08902, (201) 545-2424, Harry A. Koppel, Exec. Vice Pres.

CIRCLE INQUIRY NO. 127

### Nine Volt AM Tuning Diode

Motorola's nine volt Silicon Tuning Diode permits design into AM Radios operating from the popular lower voltage battery. The MVAM109 boasts a minimum tuning ratio of 12 over a 1-9 volt control range, with the high 460 pF capacitance required to tune AM signals with available high Q antenna and oscillator coils.



The MVAM109, MVAM115 (15 volt) and MVAM125 (25 volt) allow tuning of AM broadcast receivers either by a manual, potentiometer controlled voltage, or by automatic sweep and phase-locked tuning systems.

Available from stock, Motorola's tuning diodes start at \$1.10 in 100-up quantities. For more information contact Motorola Semiconductor Products Inc., P.O. Box 20912, Phoenix, AZ 85036, (602) 244-4556, Harold Frede.

CIRCLE INQUIRY NO. 116

### 30 Amp Miniature Relay

A miniature series of relays, RB and RX are available in printed circuit, solder or quick disconnect terminations — both in normally open (RX) or normally closed (RB) contact configurations from Artisan Electronics.



This versatile relay is well suited for many applications where switching of high current, dependability and low price are important. Both are UL recognized.

Price is about \$2.00. For more information contact Artisan Electronics, 5 Eastmans Rd., Parsippany, NJ 07054, Alan Seman.

CIRCLE INQUIRY NO. 118

### High Speed IDM2901A-1 Bit Slice

The IDM2901A-1 is a superfast version of the IDM2901A four bit slice microprocessor from National Semiconductor. The new version features a maximum 16-bit add-and-shift (multiply)

throughput time of only 95 nanoseconds plus a carry lookahead time of 10.5 ns, applying a 16MHz clockspeed. Power consumption is 800 milliwatts at 25°C.

With this device, emitter-coupled logic-type speeds are possible, with no more power required than for LS bipolar designs.

The key to its high performance is the use of a proprietary process called "Schottky-Coupled-Logic" or SCL™, which combines on the same die low power Schottky devices with ECL circuitry.

The new part is offered in a 40-pin ceramic dual-in-line package at \$29 each in 100-up quantities. For more information contact National Semiconductor, 2900 Semiconductor Dr., Santa Clara, CA 95051, (408) 737-5000.

CIRCLE INQUIRY NO. 117

### 6A Miniature Rectifiers

A new line of miniature 6 ampere ion-implanted rectifiers from Solid State Devices block up to 100V and have a recovery time over two times faster than conventional devices.



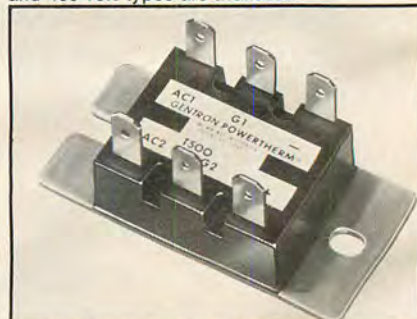
Designated the HSR-252 series, the devices have a typical reverse-recovery time of 15 nanoseconds with a maximum recovery time of 20 nsec. Maximum forward voltage drop, at 100°C junction temperature, is 825 millivolts; maximum reverse-leakage current is 20 microamperes.

The HSR-252 ultra-high-speed rectifiers are priced from \$1.90 to \$4.25 each in 100 to 999 quantities. High volume quantities are less than \$2.00. Delivery is 4 weeks ARO. For more information contact Solid State Devices, Inc., 14830 Valley View Ave., La Mirada, CA 90638; (213) 921-9660.

CIRCLE INQUIRY NO. 120

### SCRs

25 ampere SCR Powertherm bridge rectifier circuits have a low thermal resistance typically less than 0.5°C/W-J.C. Applications of 120, 230 and 460 volt types are available.



The heat sink mounting plate is isolated between the base and the terminal thus eliminating elaborate isolation schemes. Breakdown isolation exceeds 2500 volts. Eight circuit combinations are offered.

The Powertherm process also lends itself to special custom power circuits that can include active and passive components, often resulting in significant economic advantages.

For more information contact Gentrion Corp., 6667 N. Sidney Pl., Milwaukee, WI 53209, (414) 351-1660.

CIRCLE INQUIRY NO. 121



## Catalog of Computer Equipment and Accessories

The GEN/COMP 1978 Catalog of Computer Equipment and Accessories is a conveniently indexed reference guide to a line of peripheral interfaces, modules, and subsystems for use with DEC, Data General and other computers. Also included in the catalog are support products and cables for terminals and modems.



Fully illustrated and formatted for easy access to information, the 12-page catalog provides descriptions of each product type complete with brief application notes. It also gives current pricing information and ordering instructions.

The catalog is available free. For a copy or more information contact GEN/COMP, Inc., 6 Algonquin Rd., Canton, MA 02021, (617) 828-2008, Gerald E. Nutter.

CIRCLE INQUIRY NO. 207

## Programmable Terminal Data Sheet

A new two-page product sheet describing Datamedia Corporation's Elite 4000A Programmable Terminal System is available free of charge from the company.

The two-color bulletin provides information about the Elite 4000A, a highly flexible, modular computing system that gives designers flexibility not previously available in display formatting, text editing, data collection, and processing.

The sheet outlines operating features of the terminal system — including its block-oriented display organization for fast insertion, deletion or rearrangement of text; interrupt-driven, vectored I/O; direct memory access capability; 8-level video; stored memory tag bits; expandable display memory (to 32K); expandable I/O; expandable character set; and switch-selectable soft/hard keyboard — and specifications for use by both end users and OEM firms.

For a copy or more information contact Datamedia Corp., 7300 N. Crescent Blvd., Pennsauken, NJ 08110, (609) 665-2382, Robert Sullivan.

CIRCLE INQUIRY NO. 202

## Microcomputer Troubleshooting Simplified

This Microcomputer Troubleshooting Manual was written to be understood and used by the non-engineer/technician. However, it contains much information which will prove useful to the experienced computerist.

The manual consists of brief, easy-to-follow instructions for debugging newly assembled kits, also detailed instructions for repair of malfunctioning equipment which has worked properly at some time prior to failing.

The following additional useful data and information is also included: a) Explanation of how memory space is allocated by address bits; b) A do's and don't's section which contains helpful hints on wiring, soldering, removing boards, checking power, etc. This section

alone may save an individual several hundred dollars in valuable PC boards and ICs; c) A glossary of terms used within the manual; d) Some literature which has been found useful and which is recommended for inclusion within a technical library; e) Some recommended sources for obtaining computer parts and literature; f) A chart showing both Octal and HEX memory address numbering; g) A digital gate decode chart showing Ands, Ors, Nands, Nors, and their obverse.

This manual is available for \$5 only by mail from Micro-Info Associates, P.O. Box 849, Castroville, CA 95012.

CIRCLE INQUIRY NO. 203

## Constructing a 4½ Digit DMM

A new applications note is available which provides construction data and operating notes which will enable the reader to build a 4½-digit auto-ranging DMM using Intersil's recently-introduced ICL7103A/8052A A/D converter chip pair.

Applications Bulletin A028, "Building an Auto-ranging DMM with the ICL7103A/8052A A/D Converter Pair," describes the operation and potential pitfalls of an auto-ranging scheme with 10 µV resolution ( $V_{ref} = 100$  mV). Two separate auto-ranging DMM/DPM circuits are included, along with design hints and circuit troubleshooting suggestions.

For more information contact Intersil, Inc., 10710 N. Tantau Ave., Cupertino, CA 95014, (408) 996-5406, Jack Kompan.

CIRCLE INQUIRY NO. 204

## Introduction to BASIC

BASIC from the Ground Up, by David E. Simon. Newcomers to the computer field (whether students or hobbyists) can now learn all about the BASIC language in this simple introduction that requires only a minimal knowledge of algebra. It assumes you know nothing about computers and explains everything from the very beginning.

All the statements of BASIC are covered as well as what actually goes on inside the computer when you are programming. The book is written with a light touch, making it enjoyable to read.

The book covers one version of each of the BASIC statements and points out some of the variations. This approach prepares you to write programs in any version you encounter. A selection of exercises and problems round out your experience.

Price is \$8.95. The book is a paperback, 232 pages long, order number ISBN 0-8104-5760-1. Hayden Book Co., Inc., 50 Essex St., Rochelle Park, NJ 07662.

CIRCLE INQUIRY NO. 199

## Guide to Micros

Small Computer Systems Handbook, by Sol Libes. The emphasis throughout this primer is on the important practical knowledge that the small computer user should have to be able to intelligently purchase, assemble, and interconnect components, and to program the microcomputer.

The various applications of the personal computer are described, and the book offers an introduction to programming on the machine level and with higher level languages such as BASIC. Only a minimal knowledge of electronics is required to use this book.

Price is \$8.45. The paperback book is 208 pages long. Order No. ISBN 0-8104-5768-8. Hayden Book Co., Inc., 50 Essex St., Rochelle Park, NJ 07662.

CIRCLE INQUIRY NO. 200

## Intro to Micros/Review of Products

Consumer's Guide to Personal Computing and Microcomputers, by Stephen Freiburger and Paul Chew. Here are two valuable books in one: an introduction to the principles of microcomputers that assumes no previous knowledge on the reader's part, and a review of 64 microcomputer products from over 50 manufacturers.

Other features of this consumer's guide are extensive illustrations to reinforce the discussions; a selection and sources section to assist you in reviewing, selecting and purchasing microcomputer products; summary charts of major microcomputer products offering a quick summary of specifications for a given product; and comment sections covering the advantages, disadvantages, and best-buy tips for each microcomputer product.

Paperback order no. ISBN 0-8104-5680-X has 176 pages. Price is about \$7.95. Hayden Book Co., Inc., 50 Essex St., Rochelle Park, NJ 07662.

CIRCLE INQUIRY NO. 201

## International Data Catalog

Detailing its complete line of data communications products, International Data Sciences' full catalog for 1978 contains 166 pages of technical specifications, illustration, and application configurations for digital test and monitoring equipment.



There is a section of articles on the fundamentals of tech control diagnostics. Also presented is an extensive array of TDM, modem, and high-speed test sets; data monitors; switches, data cables and much more.

The catalog is a comprehensive guide to data communication test equipment from a pocket-sized breakout panel to a state-of-the-art, microprocessor-based line monitor.

For a copy or more information contact International Data Sciences, Inc., 7 Wellington Rd., Lincoln, RI 02865, (401) 333-6200, Mktg. Dept.

CIRCLE INQUIRY NO. 209

## Distributed Data Processing Literature from Basic/Four

A four-color brochure entitled "A Business-like Solution to Distributed Data Processing" is now available from Basic/Four Corporation, an MAI company.

The 14-page booklet describes DDP capability of Basic/Four Computer Systems — how they work and how they can be used. The system software, the basic operating system software and the application software are also discussed.

Four configurations are offered including a basic system, multiple systems, multi-processing, and network processing.

For further information or a copy of the brochure, contact Basic/Four Corp., Communications Dept., P.O. Box C-11921, Santa Ana, CA 92711, (714) 731-5100.

CIRCLE INQUIRY NO. 210



# Software

## Program Development System

PDS is an exceptionally powerful assembly language development system for 8080 or Z80 microcomputers with at least one disk drive. PDS includes a unified assembler/editor, a macro assembler combining the features of a relocating linker loader, a string oriented text editor, and a trace debugger/disassembler.

The assemblers favor the Intel instruction mnemonics treating the Z80 superset as a logical and syntactical extension. The debug module features breakpoint or single-step execution of programs, with trace display of all register contents, flag status, a memory window, and the mnemonics of the instruction just executed and the next instruction to be executed.

The power of PDS derives from the interactive environment afforded by the assembler/editor and the debug package. Program modules can be modified, assembled and checked in seconds under the tight control of trace execution.

To facilitate development of applications programs with PDS, source modules are available for floating point arithmetic, floating point input/output, trigonometric functions, numerical and alphabetic sorting, matrix inversion, fast Fourier transform, and a full function expression evaluator.

PDS is available to dealers and manufacturers for whom custom interfacing and documentation will be provided. For more information contact Allen Ashley, 395 Sierra Madre Villa, Pasadena, CA 91107, (213) 793-5748.

CIRCLE INQUIRY NO. 392

## Chess for PET, TRS-80, Apple

Microchess is the culmination of two years of chessplaying program development by Peter Jennings, author of the famous 1K byte chess program for the KIM-1.



Microchess 2.0 for 8K PETs and 16K Apples, in 6502 machine language, offers 8 levels of play to suit everyone from the beginner learning chess to the serious player. It examines positions as many as 6 moves ahead, and includes a chess clock for tournament play.

Microchess 1.5 for 4K TRS-80s, in Z-80 machine language, offers 3 levels of play. Both Level I and Level II versions are included and can be loaded on any TRS-80 without TBUG.

Microchess is priced at \$19.95 and is available from computer stores nationwide or by mail from Personal Software, P.O. Box 136, Cambridge, MA 02138, (617) 783-0694.

CIRCLE INQUIRY NO. 444

## CMS-2Z by 4C

Command, Control and Communications Corporation (4C) has significantly enhanced its CMS-2Z version of the Navy's CMS-2 Compiler. The high level programming language is being used extensively by the armed forces and, though specifically designed for command and

control applications, CMS-2Z can be used in many other scientific and real-time applications.

The CMS-2Z Compiler is written in a subset of the standard FORTRAN language (ANSI 1966 x 3.9) using no formatted I/O. It is functionally modularized, thus facilitating overlaying maintenance and extensibility. The compiler is very portable and is currently being hosted on very large and small computers.

For more information contact Command, Control and Communications Corp., 1823 W. Lomita Blvd., Lomita, CA 90717, (213) 325-6883.

CIRCLE INQUIRY NO. 382

## TEXT

TEXT is a text processor (also called a word processor) which executes on the EPA Micro-68b computer with the following equipment: 16K of RAM memory, one floppy disk unit, one CRT terminal and a printer. TEXT accepts lines of source text interspersed with lines of format control information and formats the text into a printable paginated document having a user-designated style.

Some of the more important capabilities of TEXT include: Left and right justification, automatic word hyphenation, page headings, page footings, including page numbers, indenting, centering, single or double or triple spacing of lines, footnotes and bibliography references, and numerous others.

In summary, TEXT is a very powerful but easily learned utility which harnesses the power of the computer to simplify document preparation and modification. For more information contact Electronic Product Associates, Inc., 1157 Vega St., San Diego, CA 92110, (714) 276-8911, Chuck Bennett.

CIRCLE INQUIRY NO. 387

## Air Conditioner Selection Program

ACSP, written in North Star BASIC, allows the calculation of the necessary capacity of an air conditioner in BTU/hour. Taking into account the heat gain through windows, walls, ceiling, floor, electrical equipment and number of people in room. It also takes into account the heat loss through doors and arches. The program applies a correction factor depending on locality in the United States.

Also available are North Star error messages and their meaning.

Price of the ACSP package on a diskette with a user manual is \$19.95. Price of the North Star Error Message Summary is \$5. Both are available from HSC Computer Services, Ltd., P.O. Box 43, Brooklyn, NY 11236.

CIRCLE INQUIRY NO. 388

## Minicomputer-Based System Development Software

OEMs using American Microsystems, Inc., S2000, S6800 and S9900 microprocessors can now obtain minicomputer-based software from The Boston Systems Office, Inc., for developing their systems designs.

Minicomputer-hosted software available for design development includes cross assemblers, relocating cross assemblers, cross linkage editors and simulator-debuggers for all three AMI microprocessors. To reduce the execution time and minimize main memory requirement, all of the software is written in host CPU assembly language.

Minicomputers for which the software is written or near completion include DECsystem10, DECsystem20, PDP-11, and Data General NOVA, SuperNova and Eclipse.

The software permits a system designer to use the exact instruction set of the AMI

microprocessor on the minicomputer. Incorporation of a macro-instruction capability in the development software permits writing an unlimited-size block of instructions as a single macro-instruction. The process shortens source files and makes program listings more intelligible. Conditional assembly instructions in the software permit generating several versions of a program using a single source file.

For more information contact The Boston Systems Office, Inc., 400-1 Totten Pond Rd., Waltham, MA 02154, (617) 890-0888 or American Microsystems, Inc., 3800 Homestead Rd., Santa Clara, CA 95051, (408) 246-0330, Tom Edel.

CIRCLE INQUIRY NO. 389

## DOS

Heurikon BASIC & DOS is a multilevel system offering two levels of concurrent operation and a disk operating system with particularly efficient file management.

The system provides both "Edit" and "Real-time" program areas which run concurrently. Realtime programs run independently from the keyboard and program editing functions. A realtime program is given highest operating priority and may be started automatically in response to external stimuli.

Edit area programs will be interrupted to service realtime operations. When the realtime program completes a task, control is returned to the interrupted point in the edit program. New programs may be developed and tested in Edit while the realtime program continues to monitor external events.

A particularly beneficial feature of Heurikon BASIC & DOS file management architecture is that it allows any number of variable length files to be cataloged on the diskette. As files are created or modified, additional sectors are attached to the end of the file as required. When sectors become available (e.g., after purging a file) they are returned to the available space pool.

This system is available configured to run the Heurikon MLZ-80 microcomputer system. The MLZ-80 is fully compatible with Intel's SBC Multibus. Heurikon BASIC & DOS can be provided on diskette or in EPROM. For more information contact Heurikon Corp., 700 W. Badger Rd., Madison, WI 53713, (608) 255-9075, Chris Priebe.

CIRCLE INQUIRY NO. 381

## Z-80/8080 Disassembler

A powerful new disassembler uses Intel 8080 mnemonics for 8080 instructions, and compatible mnemonics for Z-80 instructions. REVAS produces an assembly-like listing from object code in memory.

REVAS automatically generates labels and builds a symbol table that can be listed at any time. It also allows full symbol table editing. A search command produces a list of all the instructions that reference a specified label, and another command produces a comprehensive cross-reference listing of all symbols.

REVAS distinguishes between data and instructions, both in list format and by label assignments. 19 easily used commands give complete control of the disassembly process, selection of output devices, interaction with system monitor, and assignment of memory usage.

REVAS requires only 4K bytes of memory, plus enough space to accommodate the current list of symbols. A comprehensive 32-page User's Manual, with examples explaining the operation and use of REVAS, is included.

REVAS is available on Tarbell cassette for \$48, and on North Star compatible disk for \$51;



manual only is \$5. Available from the Byte Shop of Lawndale, 16508 Hawthorne Blvd., Lawndale, CA 90260.

CIRCLE INQUIRY NO. 377

### Selector II

Selector II is a data entry and demand reporting system for users of CP/M and Microsoft Extended Disk BASIC. It provides timely information at the user's fingertips, as well as allowing on-line updating of data files.

Unique reports can be generated in minutes, with no programming experience required. The required information is simply selected with any variety of conditions desired and in the order wanted. Output can be used by programs, displayed or printed as a titled, columnized report.

Selector II provides more flexibility than many large systems. One time license price of \$225 includes one year warranty. Selector II is available on single-density 8" diskette complete with user's manual. To order or for more information contact Micro-Ap, 8939 San Ramon Rd., Dublin, CA 94566, (415) 828-6697.

CIRCLE INQUIRY NO. 379

### Stand-Alone Editor and Assembler

The E/65 text editor and A/65 two-pass assembler are designed to run on any 6500 based system. Each program is designed with transfer vectors to link the program to I/O routines in the user's system.

E/65 is primarily designed to edit assembler source code. Line oriented commands specify input/output of text and find specific lines to be edited. String oriented commands allow the user to search for and optionally change a text string. Character oriented commands allow cursor positioning and character deletion. Text may be loaded from or dumped to a bulk device other than the system terminal. E/65 also features a second entry point to edit text which is already in memory.

A/65 is a full two-pass assembler which conforms exactly to the specifications detailed in the Rockwell and MOS/Technology cross assembler manuals. A full range of run-time options are provided to control listing formats, printing of generated code for ASCII strings and generation to object code.

E/65 and A/65 are priced at \$100 each pre-paid. Listings of the source code are available for \$25 each. For more information contact Computer Applications Corp., 413 Kellogg, Ames, IA 50010, (515) 232-8187, Mike Corder.

CIRCLE INQUIRY NO. 378

### Try Before You Buy Computerized Accounting System

A time share utility that can be converted to a turn-key operation when the need for an in-house computer system arises is available from DataVantage Corporation.



DataVantage Services provide small to medium sized businesses with a full accounting system on a package rate time share basis with the option of converting at any time to a turn-key system using the identical software, printer, and terminal. Subscribers need no programming knowledge to use the English-like language and self-prompting software.

DataVantage Services are priced according to customer needs and include a minimum of one terminal, printer, acoustic coupler, and fixed amounts of monthly and hourly usage and on-line storage. For more information contact DataVantage Corp., 30 Commerce Way, Woburn, MA 01801, (617) 935-7788, Suzanne Long.

CIRCLE INQUIRY NO. 216

### KFAM

KFAM system software for the 8080, 8085 and Z-80 microprocessor is designed around North Star's BASIC, version 6 with 14 digit precision. The micro KFAM saves the engineer or programmer 80% of the normal time required to code the original application program or modify an existing subsystem.

The application programmer utilizes KFAM subroutines to handle data transmittal, packing and unpacking of data to maximize storage area, sorting upon input by keys, opening and closing of files, self verifying of files, and the modular design of application software. KFAM contains a keyboard input utility for displaying data on a video screen, accepting the keyboard input, cursor positioning, and validation of data. Utilities to add records, delete records, and examine or alter existing records are included.

Normally, sorting of input data is required by any existing programs designed for the microprocessor. KFAM eliminates the need of sorting by utilizing keys as new records are written to the files. The key allows for random access during batch processing.

KFAM system software with complete documentation is \$550. Documentation without source code is \$75. KFAM is available on diskette or tape. Application software is also available. Dealer inquiries welcome. For more information contact ComputerCo, Inc., 5833 Dorchester Rd., Charleston, SC 29405, (803) 552-8533.

CIRCLE INQUIRY NO. 393

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## Bridge for PET, TRS-80, Apple

Bridge Challenger lets you and the dummy play four person Contract Bridge against the computer. The program will deal hands at random or according to your criterion for high card points, and you can save hands on cassette and reload them for later play.



You can review tricks, rotate hands east-west, shuffle only the defense hands, or replay hands when cards are known. No longer do you need four people to play.

Bridge Challenger is priced at \$14.95 and is available from computer stores nationwide or by mail from Personal Software, P.O. Box 136, Cambridge, MA 02138, (617) 783-0694.

CIRCLE INQUIRY NO. 443

## Word Processing Software

Promedics Data Corporation, a turnkey computer system and software company, has a Word Processing System for professional applications. The software is very flexible in nature and has features found only on larger more expensive computers. These features include disk storage of files, automatic data insertion, global search and replacement, block text move or copy, bell warning at end of line, ruler option, automatic centering, underlining, cursor backspace and erase, automatic new

line generation, paging, and multifile concatenation.

The software is written in BASIC and runs on any system supporting a BASIC compiler and interpreter. The software is currently running under the CP/M operating system and under RSX-11M with BASIC + 2. The software is available to both end users and OEMs. The single user license fee is \$750 or a complete turnkey system including general ledger and accounts receivable is available for \$13,500.

For more information contact Promedics Data Corp., 1032 Elwell Ct., Suite 240, Palo Alto, CA 94303.

CIRCLE INQUIRY NO. 416

## Educational Program

Musgrove Engineering has a Foreign Language Series educational program, Foreign Language Vocabulary, which is a bi-directional program for the instruction, practice and testing of language vocabulary skills. Languages offered include French, Spanish, Italian and German.

Program features include separate modes for vocabulary instruction, practice drills and testing, selectable by the user at any time during program operation. The user may also alternate language direction (English-to-French or French-to-English) to improve comprehension.

The instruction mode displays the randomly selected word in both languages; the practice mode displays the word in one language and permits several user guesses before printing the correct answer; the testing mode permits the user to select the number of words to be tested and returns the test score upon completion. The Educator option permits the creation of files for the storage of student identification, test responses and test scores, for use in a classroom situation.

Foreign Language Vocabulary is written in BASIC for ease of adaptation to all microcom-

puter systems. Each volume includes an annotated program listing and program flow chart to assure ease of user loading and understanding. Single-statement lines are used to avoid confusion and to permit ease of user modification.

Each volume is priced at \$5.00 with the Educator option costing an additional \$3. All four volumes are \$17.50 and \$27.50 with the Educator option. For further information contact Musgrove Engineering, 9547 Kindletree Dr., Houston, TX 77040, (713) 466-3486.

CIRCLE INQUIRY NO. 383

## "Standard MUMPS"

The ANSI-Standard MUMPS language is for mid- to high-end PDP-11 minicomputer systems. Called DSM-11 (Digital Standard Mumps), the software package runs on appropriately configured PDP-11/34, -11/60, and -11/70 computer systems. DSM-11 is a complete implementation of ANSI-Standard specification X11.1-1977, with significant extensions.

MUMPS, a data-base-oriented high-level programming language, was originally developed at Massachusetts General Hospital for medical information storage and retrieval. The DSM-11 package includes the MUMPS interpreter, an operating system, and a hierarchical file system. As a data-base management system for medium to large PDP-11 configurations, DSM-11 is a vehicle for implementing medical and commercial information systems.

Minimum hardware requirements for DSM-11 are 32K words of memory and one of DEC's appropriate disk subsystems with a minimum 7.5 megabytes capacity. Additional memory, data storage, and input/output devices are supported.

For more information contact Digital Equipment Corp., Maynard, MA 01754, (617) 481-9511, Ext. 6973, David Simler.

CIRCLE INQUIRY NO. 384

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## PROGRAMMERS CONTEST

INTERFACE AGE Magazine has a contest for all programmers - professional or hobbyist. The contest is to write a game based on the new television show Battlestar Galactica.

The prizes include: a two-year subscription to INTERFACE AGE and the publication of your game paid at the prevailing author rates.

### HERE ARE THE RULES:

- The game must be written in assembly code for any machine of your choice.
- The game must include all the prime characters in the television show.
- The game cannot be based around ships shooting ships.
- The game can utilize graphics at the start and throughout the game.
- The accompanying article must include how to play the game, and exactly how the code works.

Each submitted game will be judged on creativity, coding style, clarity of the game instructions, and how the code works.

### DEADLINE AND SUBMITTAL FORMAT

All submittals must be received at the INTERFACE AGE editorial offices not later than April 1, 1979. Each submittal must be accompanied by a self-addressed stamped envelope and an IAPS formatted tape of the code. The tape must contain both source and object code. The article must be in the format described on page 32a of the March 1978 issue.

Send your entry to Carl Warren, Senior Editor, INTERFACE AGE Magazine, P.O. Box 1234, Cerritos, California 90701. Please no phone calls.



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# BOOK REVIEWS

## AN INTRODUCTION TO MICRO- COMPUTERS, VOLUME II — SOME REAL PRODUCTS

By Adam Osborne. Osborne & Associates. \$7.50

Review by Roger H. Edelson, Hardware Editor

This volume is a revision of the second volume of Adam Osborne's *An Introduction to Microcomputers*, and as such it is a little hard to review as a separate entity. Volume II is a stand-alone, detailed, comprehensive description of some 9 specific microprocessors. Unfortunately, because of the pressure of the publishing deadline, the other 11 microprocessors are covered more superficially. I would expect that this problem will be corrected in the third revision. While there will undoubtedly be arguments, the 9 devices covered are the more popular microcomputers available, perhaps with the exception of the 2650.

This book is a hardware designer's view of the micro-computer chip; while summaries of the instruction sets are given, no detailed programming descriptions are included. This information is sufficient for the needs of the hardware engineer or subsystem designer.

The book is not particularly intended for use as a comparison between the various available microprocessors. Instead, it delves deeply into the internal operation of the chip, allowing the designer to select a microprocessor based on its interface with the specific design criteria of his system. Information is provided on wait, hold, and halt states to allow the design of DMA (Direct Memory Access) functions. Interrupt operation is discussed in detail, and for the more popular devices the operation of some of the peripheral chips is also covered.

I consider this volume to be an absolute must for the working design engineer. □

## STAR SHIP SIMULATION

By Roger Garrett. dilithium Press. \$6.95

Review by Corey G. James

It only takes a few moments of flipping through Mr. Garrett's book to discover that the Star Trek craze is not dead. Not only is the extreme interest in Star Trek and the Enterprise still alive, it has grown to new dimensions with the introduction of an elaborately designed simulation program, *Star Ship*. The unlimited capabilities of this program will make any true Star Trek fan quake with excitement. However, Garrett does not go into great detail until after he sets out to sell the concept of simulation programming.



Garrett justifies simulation programs by the useful information they can generate about any situation or experiment without actually executing anything more than a program written for any particular circumstance. Therefore, new and highly valuable data is obtained inexpensively and at a far greater degree of practicality. Garrett goes on to say that anyone can write a program, no matter how complicated the end objective may be, by following a simple, straightforward process.

The "logical, straightforward, break-it-apart-and-tackle-it, piece-by-piece manner" that Garrett suggests is elaborated on in the first two chapters of the book. Both chapters bring out some excellent basic points dealing with program design, but the concepts given are very simplistic. Hence, chapters one and two are geared for the inexperienced programmer and will probably prove to be of no great value to a programmer with any background. However, if the reader's programming capabilities are weak, the section dealing with "English-like grammatical construction" and debugging techniques may be of some assistance; potential possibilities of confusion do exist for the beginner. Garrett then uses the Star Ship simulation program to help illustrate his programming techniques.

The remainder of the book gives a brief description of the major functions of the program as well as giving the program to the reader in structure language. The capabilities of the program seem endless due to the complexity of each function.

The programmer discovers he will have his own starship and bridge fully equipped for anything possible since the ship is located in a time having such features as a Federated Star Fleet, enemy-seeking photon missiles, fully equipped enemy starships, and anything else the reader might imagine or remember from the Star Trek scripts. The excitement that can be generated in Star Trek fans will leave them in extreme anticipation to begin programming this simulation. The last chapter, "Implementation", helps sum up the feasibility of the program and its operation. This section could also prove a damper to the programmer's enthusiasm.

Of key importance is Garrett's design which seems to be ideal for a massive and extremely sophisticated computer center (as a matter of fact, the suggested multi-processor and multi-console setup is very similar to the bridge of the Enterprise). The availability of this type of equipment to the average programmer is highly unlikely, and it is doubtful if even multi-processor or multi-console setups are available to most of the potential users of this program. To use the type of equipment that most game playing hobbyists have access to will limit the reality of the entire situation. The typical hobbyist's computer will not have enough main memory storage or a compiler for high level language (forcing the programmer to use a slower more familiar computer language — BASIC, FORTRAN, etc.), and will usually have only one CRT console using an alphanumeric keyboard. Besides the limitations placed on this simulation due to the computer used, there are other problems that will face the programmer.

It has already been noted that the program is only given in structure language. This leaves the majority of the work to the programmer. Therefore, implementation of the simulation can only come about after the program has been set to a specific computer language and all of the functions have been polished. The consequence is a ridiculous mismatch of content by Garrett in his book.

This created a situation where the reader, who the program writing is geared for, would not be able to truly appreciate the simulation and would most likely find it impossible to make the necessary adaptations to the skeletal program. A programmer who could adapt the

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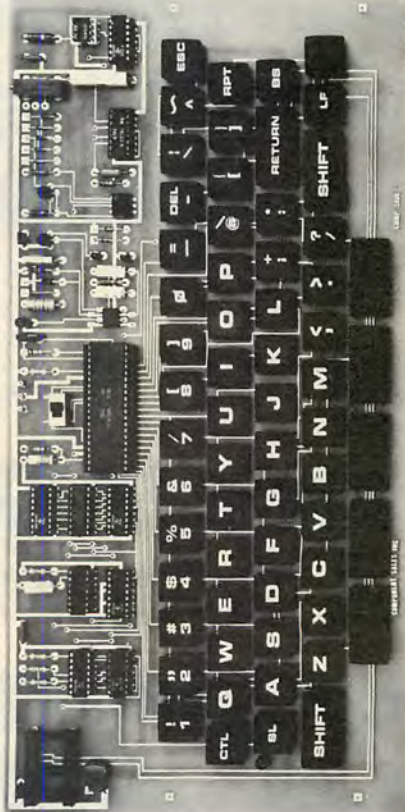
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## BOOK REVIEWS

(Continued from previous page)

simulation to any specific computer for implementation would find no need for any other section in this book due to its overly simplistic approach. However, Garrett has done an excellent job of creating a pipe-dream for the Star Trek fan who enjoys envisioning himself as Captain Kirk. □

## JOB CONTROL LANGUAGE

By Ruth Ashley and Judi N. Fernandez

John Wiley & Sons, Inc. 1978

164 pages, \$4.95

Review by J.M. Balestrieri

IBM's Job Control Language (JCL) is used to access the operating system. It is a language just as FORTRAN, BASIC, or PL/I. Therefore, to work on an IBM 360/370 system, a programmer must be conversant in a minimum of two languages, the applications language and JCL. It also means that any job has twice the opportunity to bomb. It is aggravating to submit a job and go away for a few hours, expecting on your return to have reams of paper awaiting you, only to find a few sheets with "FATAL JCL ERROR" stamped all over them. And sometimes IBM manuals are not all that illuminating. There are plenty of books on FORTRAN or PL/I, but not too many on JCL.

To fill this gap comes *Job Control Language*, a self-teaching guide by Ruth Ashley and Judi Fernandez. The book cover says it uses "simple, everyday language," and "avoids options rarely used in the real world." All this is done in the format of "time honored techniques of instructional technology."

Simple, everyday language is insufficient to explain JCL. The "real world" is somewhere north of nowhere (if you find it, you're doomed). And would someone please explain what "instructional technology" is?

The authors attempt to build on a simple programming task, adding steps as they go along until they deal with a complicated job with many steps and data sets. Every few paragraphs there are pertinent questions for the reader to answer. (This is, after all, a self-teaching guide.) The answers provided by the authors are rarely commented. If your answer is wrong, you're on your own to try and figure out why.

The authors tell the reader exactly what will be learned at the beginning of each chapter; and sometimes they even tell the reader exactly what has been learned at the end of a chapter. That sort of approach is nothing but offensive.

Chapter seven and part of chapter eight deal with three IBM utilities (IEBGENER, IEBPTPCH, IEBUPDTE). These are powerful and very useful utilities, but they are not a part of JCL. Rather they use JCL, and as such they should be referenced as footnotes or in the form of an appendix.

The authors state at the outset that the reader will not learn all there is to know about JCL from this self-teaching guide, but that the reader will have some measure of competency with JCL after finishing the book. That is doubtful.

For now stay with IBM's JCL manual. If worse comes to worse, it at least has some value as a reference. □



# A Generalized 8080 String Sorting Routine

By Chris Terry

## INTRODUCTION

This article describes a generalized 8080 Assembly Language sorting routine (SORT) which will handle both table entries and files created by the Microtec Editor/Assembler package. The Processor Technology version of this (in high memory) is known as Software Package No. 1; the IMSAI version (in low memory) is called the Self-Contained System (SCS). They are essentially the same, except that the high-memory version has a routine for programming 1702A PROMs. For the sake of simplicity, the system will be referred to as SPKG1.

All parameters required by SORT must be placed by the caller in the appropriate location of the parameter block. Two drivers are provided. One (SRTDV, 50 bytes) accesses the SPKG1 work area for parameters relating to the Assembler symbol table and exits to a routine for printing the sorted table. The other driver (SRTF, 126 bytes) allows fixed-length records in a standard SPKG1 file to be sorted by means of the command:

**SORT 999 99**

where 999 is the starting column of the sort field, and 99 is the length (in bytes) of the sort field. Both are entered as decimal numbers. The SORT command must be added to the SPKG1 command table and must be followed by the address of the SRTF driver. Execution of this command sorts the currently open file; control is then returned to the SPKG1 executive. The sorted file may then be printed either by the standard LIST command or by one which omits line numbers.

### CAUTION:

In all cases, save your file on tape or disk BEFORE attempting to sort it. A single record of abnormal length can cause SORT to destroy the file irrecoverably, after which an attempt to read or edit the file may also destroy the Editor (if it is in RAM).

To minimize this problem, I have provided an optional routine that checks all file lines against line 0001 and

lists any lines whose lengths differ from that of line 0001. This routine could either be called directly by the SORT command and exit to the SRTF driver if no errors are found, or could be invoked by a separate command such as CHEK and return to the Executive.

### The general characteristics of SORT are:

Record Type:	Alphanumeric (ASCII)
Illegal Codes:	01H (end-of-file marker)
Record Length:	Fixed length, 1-255 bytes
No. of Records:	1 to 255
Sort Field Length:	1 to 255 bytes
Sort Field Pos'n:	Anywhere in the record
Record Headers:	6 bytes for SPKG1 files, but length can be specified for other files. Headers are not moved if specified header length = >1. If header length = 0, entire record is moved.
File Terminator:	01 HEX, not moved by SORT (not used in symbol/command tables)
Length of SORT:	187 bytes PROM or RAM
Length of Driver:	SRTDV, 50 bytes; SRTF, 126 bytes
Parameter Block:	13 bytes, RAM only

## BACKGROUND

The impulse to develop the sorting routine described in this article was provided by sheer frustration. The IMSAI low-memory Editor/Assembler is a good package, but it originally had no means of printing the symbol table after an assembly. There are now two symbol table printers available; the one used here is by Jay Cotton for the IMSAI SCS and prints the symbol table automatically upon completion of an assembly. The other, which is part of Objective Designs Inc. Software Package 0.5, is for Software Package No. 1 and prints the symbol table



on demand. Both of them, however, print the symbols in the order in which they were entered in the table. They are *not interchangeable* because Software Package No. 1 has addresses in the form HI,LO, whereas SCS uses the standard Intel address format LO,HI. Frustration grew when searching fairly large tables for subroutines that I wished to call from another program. The labels I wanted always seemed to be buried and invisible!

When I started thinking about a sort routine, it seemed simple. After all, a bubble sort only takes eight or nine lines of BASIC code. I soon found that even though a bubble sort of one-byte numbers can be done in 43 bytes of machine-language, sorting strings is by no means so simple. The problems were magnified when I began to think how nice it would be to sort a file of names and addresses created by the Editor. With only seven working registers, two pairs of which have to be used as pointers, I found that extreme care was needed in keeping track of records to be compared and swapped.

As I developed my ideas in that area, I found that I had also come up with an algorithm for locating any record specified by a given variable. I had, in fact, been forced to examine the basics of exactly what I was trying to do. This, of course, is the secret behind all successful programming but one that it is easy to forget when using a high-level programming language.

Having successfully developed routines for finding, comparing, and swapping any two strings of the same length, I began to get more ambitious. John P. Grillo's article on a comparison of three sorting routines (Bubble, Delayed Replacement, and Shell-Metzner [Reference 1]) stimulated my thinking. The article showed such clear advantages for the Shell-Metzner method that I abandoned the bubble-sort and started coding from the Shell-Metzner flow-chart. Here again, I had to get back to real basics and check my logic most carefully. I found that I could not afford any unverified assumptions, particularly when it came to testing variables as a preliminary to a branch-on-condition. It was a real lesson in binary arithmetic and logic, covering a lot of areas that I thought I knew but which I found out the hard way that I didn't really know thoroughly!

### PERFORMANCE OF THE SORT ALGORITHM

The Sort algorithm is a modification by Marlene Metzner of David Shell's original algorithm. It is more complex than a bubble sort in that it uses 5 variables but is much faster because it performs fewer comparisons. If  $N$  is the number of elements to be sorted, sorting time is proportional to  $N^2$  for the bubble sort and to  $N(\log N)$  for the Shell-Metzner sort.

John Grillo, in comparing BASIC sort routines, showed that for an array of 100 random numbers, the bubble sort performed 4950 comparisons and 2700 swaps in 1700 milliseconds, whereas the Shell-Metzner sort performed only 900 comparisons and 450 swaps and completed in 320 milliseconds. When the number of elements increases to 200, the sorting times are 7500 milliseconds (bubble) and 600 milliseconds (Shell-Metzner).

For small files or arrays of less than 20 elements, the bubble sort has an obvious advantage in simplicity of coding with very little sacrifice in execution time. But for arrays of 100 or more elements, the Shell-Metzner method has a clear advantage, and as the number of elements to be sorted grows larger, the time-saving is even more pronounced. Grillo's data are based on a BASIC program; the Assembly Language version described here is even faster because no Interpreter is involved. However, sorting strings obviously requires more time than sorting 1-byte binary numbers.

### OPERATION OF THE SORT ALGORITHM

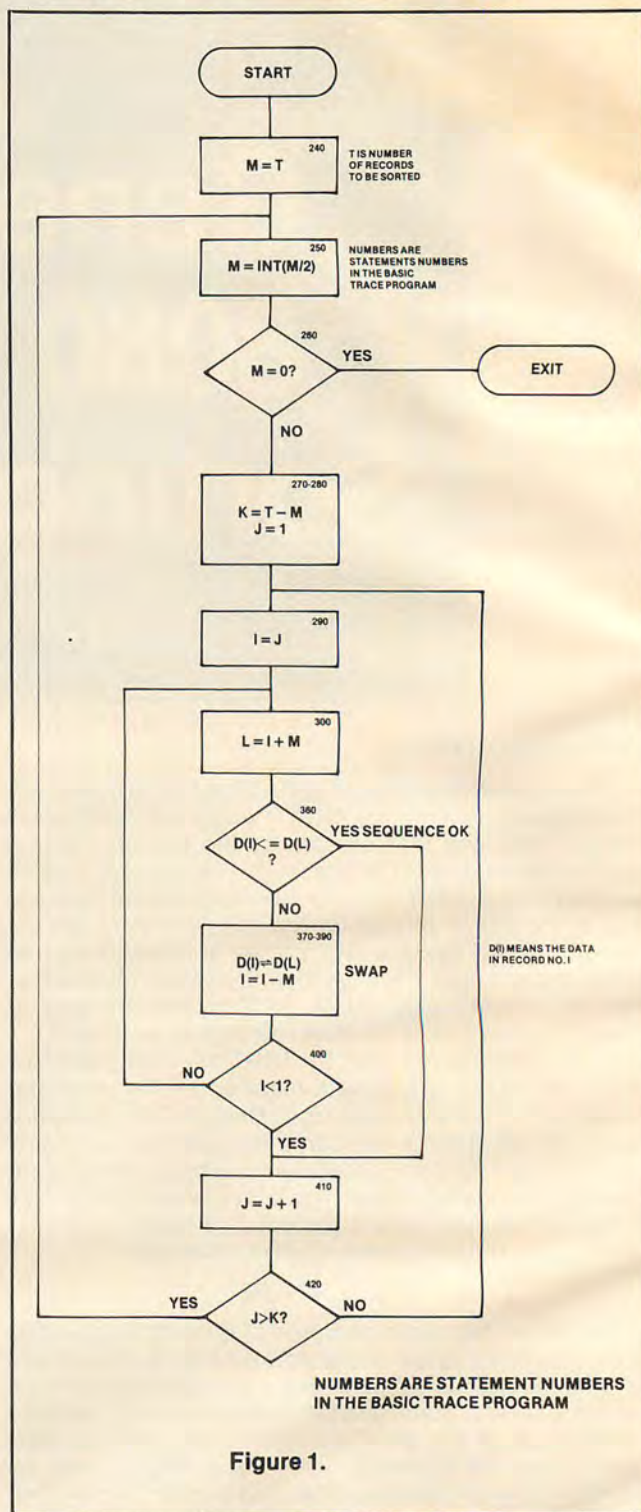


Figure 1.

The Shell-Metzner sorting algorithm is flowcharted in Figure 1. However, it is not clear from the flow-chart just how the sort works, and none of the references that I have read give any details. To satisfy my own curiosity, therefore, I coded a BASIC version of the sort with trace statements and ran it on a Xerox Sigma 9 computer. This program is given in Listing 1. Numbers on the flow-chart correspond to line numbers in Listing 1.

Lines 130-150 generate a vector (A) of 10 elements, inserting data from line 200. No attempt was made to randomize the data; I merely ensured that some numbers



were out of sequence. Grillo showed that for 10 elements approximately 30 comparisons are performed, and this number would, I felt, be large enough to be manageable. The five variables are handled exactly as shown in the flow-chart, but before each comparison is made, lines 320-340 transfer the current data element sequence to one row of a 2-dimensional matrix (B), and line 350 prints all variables and the two numbers to be compared.

Step	-I-	-L-	A(I)	A(L)	-J-	-K-	-M-	
1	1	6	278*	240	1	5	5	SECTION 1
2	2	7	25*	6	2	5	5	
3	3	8	47	95	3	5	5	
4	4	9	27	180	4	5	5	
5	5	10	69*	5	5	5	5	
6	1	3	240*	47	1	8	2	SECTION 2
7	2	4	6	27	2	8	2	
8	3	5	240*	5	3	8	2	
9	1	3	47*	5	3	8	2	
10	4	6	27	278	4	8	2	
11	5	7	240*	25	5	8	2	
12	3	5	47*	25	5	8	2	
13	1	3	5	25	5	8	2	
14	6	8	278*	95	6	8	2	
15	4	6	27	95	6	8	2	
16	7	9	240*	180	7	8	2	SECTION 3
17	5	7	47	180	7	8	2	
18	8	10	278*	69	8	8	2	
19	6	8	95*	69	8	8	2	
20	4	6	27	69	8	8	2	
21	1	2	5	6	1	9	1	
22	2	3	6	25	2	9	1	
23	3	4	25	27	3	9	1	
24	4	5	27	47	4	9	1	
25	5	6	47	69	5	9	1	
26	6	7	69	180	6	9	1	SECTION 3
27	7	8	180*	95	7	9	1	
28	6	7	69	95	7	9	1	
29	8	9	180	240	8	9	1	
30	9	10	240	278	9	9	1	

SORT DONE, 30 COMPARISONS & 13 SWAPS (\*)

Table 1 is generated and printed during the sorting process. After the sort has been completed, lines 490-510 print the total array as Table 2. Note that in both tables, the values shown are the current values BEFORE the comparison/swap of that step is performed.

STEP No.	-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-	-9-	-10-
1	278*	25	47	27	69	240	6	95	180	5
2	240	25*	47	27	69	278	6	95	180	5
3	240	6	47	27	69	278	25	95	180	5
4	240	6	47	27	69	278	25	95	180	5
5	240	6	47	27	69*	278	25	95	180	5
6	240*	6	47	27	5	278	25	95	180	69
7	47	6	240	27	5	278	25	95	180	69
8	47	6	240*	27	5	278	25	95	180	69
9	47*	6	5	27	240	278	25	95	180	69
10	5	6	47	27	240	278	25	95	180	69
11	5	6	47	27	240*	278	25	95	180	69
12	5	6	47*	27	25	278	240	95	180	69
13	5	6	25	27	47	278	240	95	180	69
14	5	6	25	27	47	278*	240	95	180	69
15	5	6	25	27	47	95	240	278	180	69
16	5	6	25	27	47	95	240*	278	180	69
17	5	6	25	27	47	95	180	278	240	69
18	5	6	25	27	47	95	180	278*	240	69
19	5	6	25	27	47	95*	180	69	240	278
20	5	6	25	27	47	69	180	95	240	278
21	5	6	25	27	47	69	180	95	240	278
22	5	6	25	27	47	69	180	95	240	278
23	5	6	25	27	47	69	180	95	240	278
24	5	6	25	27	47	69	180	95	240	278
25	5	6	25	27	47	69	180	95	240	278
26	5	6	25	27	47	69	180	95	240	278
27	5	6	25	27	47	69	180	95	240	278
28	5	6	25	27	47	69	95	180	240	278
29	5	6	25	27	47	69	95	180	240	278
30	5	6	25	27	47	69	95	180	240	278

520 HALT

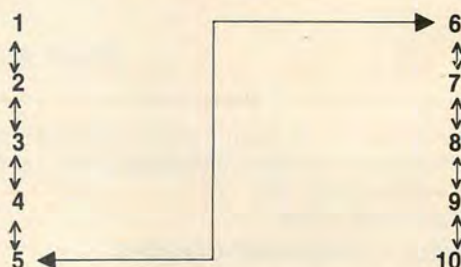
The sorting process can be broken down into three sections (diagrammed in Figure 2). Section 1 (steps 1 through 5) breaks the data array in half and compares successive elements in the lower half with the corresponding elements in the upper half (1:6, 2:7, 3:8, etc.).

1-----6  
2-----7  
3-----8  
4-----9  
5-----10

#### a. Section 1 of Sort

1-----3  
2-----4  
3-----5  
4-----6  
5-----7  
6-----8  
7-----9  
8-----10

#### b. Section 2 of Sort



#### c. Section 3 of Sort

Figure 2. Checks & Comparisons in the Three Sections of the Sort

The resulting swaps have the effect of concentrating the highest numbers in the upper half of the array. (See Table 1.)

In Section 2 (steps 6 through 20), the array is again broken into two subsets, one consisting of all the odd-numbered array positions and the other of the even-numbered positions. Then each subset is individually put into correct internal sequence. The processing is oscillatory in character. That is, successive elements within each subset are compared, alternating the two subsets (1:3, 2:4, 3:5, 6:8, 7:9, 8:10) until a swap is required; I call this 'forward checking'. When forward checking of both subsets is halted by the need for a swap, backward checking starts within the subset that needed the swap. This corrects any disordering produced by the first swap. Backward checking continues until a pair is found that does NOT need a swap; then forward checking picks up from the point at which it left off. This process shows up quite clearly in Table 1 if the variables I and L are followed down steps 6 through 20. Comparisons that call for a swap are marked with an asterisk (\*).

In Section 3 (steps 21 through 30), the two correctly ordered subsets are merged. The comparisons are performed in strict numeric sequence (1:2, 2:3, 3:4, . . . etc.). Again, forward checking proceeds until a pair is found that requires a swap; then backward checking is per-



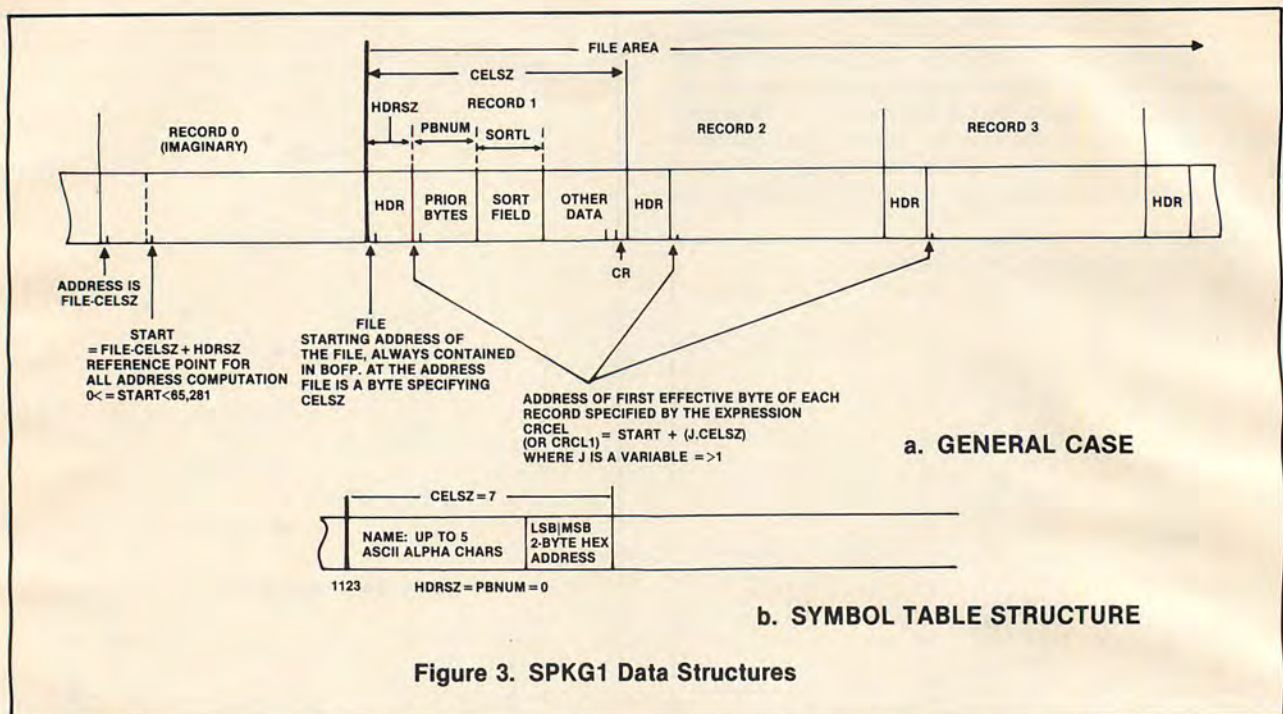


Figure 3. SPKG1 Data Structures

formed until a pair is found that does NOT require a swap, after which forward checking picks up from the point at which it left off.

#### IMPLICATIONS FOR ASSEMBLY LANGUAGE CODING

When using the bubble sort to sort strings, any string accessed for comparison is always contiguous to the last string accessed; thus, accessing the new record is merely a matter of adding the record length to the current pointer. The Shell-Metzner sort, however, requires almost random access to the records. Further, in sorting a file with Editor-generated headers these headers must be left quite undisturbed. Otherwise, the Editor will subsequently be unable to find a given record and may, indeed, cause a system crash.

In addition, the field on which sorting is desired is not necessarily at the start of the line. I therefore had to establish a reference address such that the start of any given record could always be found by adding the expression (VARIABLE times LENGTH) to the reference address and then provide for offsets which would skip over the header itself (both in comparisons and swaps) and would allow the sort field to be found within the given record. There is nothing unusual or tricky about these procedures — I explain them in some detail. However, I do so merely that other users can adapt the program without too much trouble. Adaptation is easy enough when you understand the sort mechanism, but it's extremely difficult when the processes are not clear.

#### SPKG1 FILE AND TABLE STRUCTURES

In order to understand why no less than nine parameters must be passed to SORT in the parameter block and how these parameters are used by SORT, some consideration must be given to the data structures created by SPKG1. These structures are illustrated in Figure 3. Figure 3a shows the structure of files created by the Editor and can be considered the general case. Figure 3b shows the structure of the symbol table created by the Assembler and is a special case of the general rules; for this case, header size = preliminary bytes = 0.

#### PARAMETERS CELSZ, NCELS, AND HDRSZ

Refer first to Figure 3a, which shows the layout of records in the SPKG1 file area. Each record starts with a 6-byte header. The first byte is a binary number specifying the length (in bytes) of the associated record, including both the length byte itself and the carriage return (CR) that terminates the record. The next four bytes are ASCII decimal digits which comprise the line number; numbers less than four digits long are padded with leading ASCII zeros (30H). The 6th (and last) header byte is a space which, by convention, *must* be present after a line number and *must not* be present in the four characters of an executive command. Thus, what I shall call the "first effective byte" of a record is actually located in the seventh byte position.

Unless modified, the SPKG1 input buffer will hold only 80 characters, including the CR that terminates the record. The end of the file is indicated to SPKG1 by an EOF marker (01 HEX) that follows the CR of the last record and indicates a record only one byte long (i.e., the EOF marker itself).

Listing 2 shows a dump of a short file, and the items described above are all indicated. Note, too, that the line number of the last line in the file is always stored as four ASCII decimal digits in the work area location labeled MAXL (at 102DH).

Now, if we specify that the SORT command shall operate only on the current open file, that all records in the file shall have exactly the same length, and that line numbers shall start at 0001 and increment by 1 up through 0255, then we can immediately obtain three important parameters required by SORT. At BOFP (1029H) in the work area we find the address FILE, which points to the first byte of the first record. The value of that byte is the length of the first record and, by definition, of all subsequent records. We can therefore read that byte and save it as CELSZ in the parameter block.

Next, at MAXL (102DH through 1030H) we find the highest line number in ASCII decimal format, which we can convert to binary and save in the parameter block as NCELS, the number of records to be sorted.



And thirdly, by definition HDRSZ (the length of the header) is 6. We need to know HDRSZ so that when swaps are performed, the line numbers will be left in place, and only data following the header will be moved. It is essential to leave line numbers in their proper sequence; if they are disordered, the Editor will not be able to find individual records in the sorted file, and indeed any attempt to do so may cause the whole Editor program to crash and/or destroy the file.

### THE PBNUM AND SORTL PARAMETERS

To satisfy the requirement that the sort field to be examined by the compare routine may be placed anywhere in the record, it is necessary to compute the number of preliminary bytes (PBNUM) between the end of the header and the start of the sort field. To allow several different sorts to be performed, using a different sort field (such as name, city, telephone number, etc.) each time, the starting column and length of the sort field are specified as parameters associated with the SORT command. The driver (SRTF) calls the SPKG1 subroutine ETRA to extract these two parameters, normalize them, and place them in the first eight bytes of the 12-byte ASCII buffer (ABUF, starting at 107EH).

There are, unfortunately, no suitable conversion routines in SPKG1, and the binary buffer holds these parameters in packed BCD format; the driver, therefore, calls its own conversion routine (DECBN) to do the conversion from ASCII decimal to binary. After conversion, 1 is subtracted from the starting column number to obtain the number of Preliminary Bytes, which is stored at PBNUM in the parameter block, and the sort field length is stored (unchanged) at SORTL.

### THE START, CRCEL AND CRCL1 PARAMETERS

We are now in a position to compute a reference point (X) from which the effective addresses of all records in the file can be computed as displacements equal to J times CELSZ (where J is any variable used by the sorting algorithm). Since the variables, when calling for data, always have a value of 1 or greater, we must arrange that the expression  $X + (1 * CELSZ)$  will bring us to the start-of-file address FILE (Figure 3a). Thus, address X must be equal to  $FILE - CELSZ$ ; we now add to this the value of HDRSZ as an initial offset; the value  $FILE - CELSZ + HDRSZ$  is saved in the PB location START as our reference point.

Thereafter, computing  $START + (J * CELS)$  will in all cases point to the first effective byte of the record whose line number corresponds to the current value of the variable J. The routines DISPI and DISPL evaluate this expression separately for the sort variables I and L in order to locate the records to be processed. The resulting addresses are stored in the parameter block at CRCEL and CRCL1, respectively, for use by the compare and swap routines.

The compare subroutine retrieves the current values of CRCEL and CRCL1 and adds the value of PBNUM to each of them to find the start of the sort fields to be compared. (In the case of the Symbol Table, PBNUM is always zero; thus, the addition has no effect on the result.) The string comparison subroutine COMST is then called to do the comparison and return the result in the A register.

The swap subroutine (XFER), if invoked, also retrieves the current values of CRCEL and CRCL1 and uses them as the addresses at which swapping is to start. However, when initializing the count of bytes to be swapped, it must subtract HDRSZ from the record length CELSZ. If the unmodified record length were used as the count,

the swap would move all bytes from the first effective byte of record I (or L) up to and including the last header byte of record I + 1 (or L + 1).

### THE EXIT PARAMETER

Because the SORT routine may be invoked from a number of different drivers and processing to follow the sort depends upon what is being sorted, each driver must provide the address of the routine which is to take control upon completion of the sort. This address must be deposited (LO, HI) in the 2-byte reserved location EXIT in the parameter block.

All other explanations required to implement the sort are given in the commented listings. Listing 3 shows a test file sorted (a) by name, and (b) by telephone number. Listing 4 gives the code and comments for the Symbol Table Driver (SRTDV) and the SORT routine itself. Listing 5 gives the code and comments for the File Driver (SRTF) used for sorting Editor-Created files.

Listing 6 is the file checking routine. Finally, Listing 7 contains the code and brief comments for the routine by Jay Cotton to print the Symbol Table. These all have sorted symbol tables.

### OPTIONAL FILE CHECK

During data entry, it is difficult to ensure that each record is the same length unless it is terminated with a printing character. Even then, editing may change the length of a line unless great care is taken. After SORT had totally destroyed a 200-record file that had not been saved on tape, I figured that an extra page of code would be cheaper than a hospital bill for ulcers or acute anxiety neurosis.

CHECK, for which the code is given in Listing 7, is invoked from the main command table. It checks the length of every record and prints the line numbers of any records that do not match line 0001 and then returns control to the Executive. CHECK fetches the start of file address from BOFP, accesses the byte at that location, and saves it in register B for comparison. This byte is the length of the first record, which is used by SORT as the CELSZ parameter.

CHK1 is the main checking loop, which checks the length of each record in turn against the value in B. As each byte is fetched into A, it is first checked to see if it is 01 (i.e., the end-of-file marker). If the byte is not EOF, it is compared to B. If  $A = B$ , the record is good, and ADR is called to add the length value in A to register pair HL which then point to the length byte of the next record. However, if  $A < B$ , the ERR subroutine is called. After pushing HL, BC, and PSW onto the stack, ERR fetches the line number (in ASCII decimal digits) from the next four bytes of the bad record and writes them to successive locations in the error-list area RERR. Then the registers are restored and the next record is checked.

When CHK1 finds the EOF marker 01, control is transferred to DONE. The EOF marker is deposited at the end of the error list, and pointer HL is set to the start of the error list.

PERR1 looks for the EOF marker; if EOF is not present, PERR2 outputs a 4-digit line number to the console, issues a CR and LF, and loops back to PERR1. This process continues until the EOF marker is found and when NERR prints the 'ALL ERRORS LISTED' message and returns control to the Executive.

I made this check a self-contained routine with a separate command since I prefer to do all checking in the Entry/Edit stage. However, it would be quite easy to modify the routine so that it is invoked automatically by



SORT driver and denies access to SORT itself if any errors are found. Also, if the desired sort field has special characteristics that are not validated by the entry program, validation routines could be added.

## SYMBOL TABLE PRINTER

The commented code for the symbol table printer by Jay Cotton is given in Listing 7. This module was originally invoked by the assembler upon completion of the assembly. However, when I installed the symbol table sort, the calling sequence was changed so that the assembler invokes the symbol table sort driver SRTDV, which places the address of the symbol table printer at EXIT in the parameter block. Thus, the printer is not invoked until sorting has been completed.

To allow the symbol table to be printed at any time with the SPKG 0.5 command 'PS' (or a similar command in SCS), the content of NOLA (number of labels, at 1098H in the work area) is transferred to a counter location (COUNT, 0DF9H), which is then counted down by the symbol table printer until exhausted. Control is then returned to the Executive.

After the header 'SYMBOL TABLE' has been printed, the labels and their associated addresses are printed, four to a line. The loop in statements 540-565 inserts four blanks between label/address pairs. This spacing can be adjusted by changing the argument of the MVI A instruction at statement 540; however, if the spacing is reduced to less than 3 blanks, the table becomes difficult to read. □

## REFERENCES

1. Grillo, John P. "A Comparison of Sorts," *Creative Computing*, Vol. 1 No. 6, Nov-Dec 1976. An extremely interesting and lucid comparison of three common sorting methods, with a BASIC program to generate random numbers and test the run time of the sorts.
2. Knuth, Donald E. *The Art of Computer Programming*, Vol. 3, Sorting and Searching. Addison-Wesley, 1973. The classic textbook in the field. Full mathematical treatment of the bubble sort and the original Shell sort (though there is no mention of Metzner's variation). Though a poor mathematician, I nevertheless find much in this work to enlighten and interest me, since algorithms and diagrams are explained in plain language, as well as mathematically. Teaches the basic principles underlying every conceivable method of sorting.
3. Rich, Robert. *Internal Sorting Methods Illustrated With PL/1 Programs*, Prentice-Hall, 1972. Lucid explanations and implementations of nearly 100 different methods of sorting files in place (i.e., without tapes or additional file space). The characteristics of each method are summarized, and the timings for the PL/1 implementations are given.
4. Chase, Geoffrey. "Heapsort", *Creative Computing*, Vol. 1, No. 6, Nov-Dec 1976. A BASIC implementation of a tree-sort optimized by Williams and Floyd. Chase's enthusiasm for this method should be tempered in the light of Knuth's comment that this method, beaten only by the QUICKSORT for very large files, is extremely inefficient for files of less than 1,000 items, and for files of less than 100 items can be beaten soundly even by the despised bubble sort.
5. Rerko, Andrew J. "Sorting Routines", *Kilobaud*, No. 4, April 1977. BASIC implementations of the bubble and ripple sorts, with good trace examples to show the mechanism. Well-presented within its limited scope.
6. Graham, Neill. *Microprocessor Programming for Computer Hobbyists*. TAB Books, 1977. An excellent reference work. Gives wider coverage of data structures and general design approaches than any other book directed to the hobbyist. For the sake of generality, all program examples are in an extended set of PL/M, so that the reader can translate to his own particular Assembly language. Part 6 contains good descriptions of the Bubble Sort, Shell Sort, QUICKSORT, and various merging techniques.

## LISTING 1

```

LIST
100 *LXESORT2 -- Chris Terry. Traces the operation of a
105 *Shell-Metzner sorting routine on a 10-element array.
110 C,S=0
120 DIM A(10)
130 FOR X=1 TO 10
140 READ A(X) : PRINT A(X) ;
150 NEXT X
160 PRINT
170 PRINT "ADJUST PAPER TO LINE 3 OF NEW PAGE"
180 PRINT "WHEN READY, GIVE RETURN."
190 INPUT Z
200 DATA 278,25,47,27,69,240,6,95,180,5
210 DIM B(32,10)
220 PRINT TAB(6) "TABLE 1. VALUES OF THE VARIABLES"
230 T=10
240 M=1
250 M=INT(M/2)
260 IF M=0 THEN 440
270 K=T-M
280 J=1
290 I=J
300 L=I+M
310 C=C+1
320 FOR X=1 TO 10
330 B(C,X)=A(X)
340 NEXT X
350 PRINT USING 530,C,I,L,A(I),A(L),J,K,M
360 IF A(I)<A(L) THEN 410
370 S=S+1 : Y=A(I)
380 A(I)=A(L) : A(L)=Y

```

## LISTING 3

LIST	(ORIGINAL)	
0001	1 ARBUTHNOT, C.	252-8761
0002	2 WILLIAMS, J.	979-0541
0003	3 JAMES, R.S.	832-4553
0004	4 RONALDSON, A.S.	775-4498
0005	5 JOHNSON, R.J.	686-5818
0006	6 ABRAHAMS, B.J.	334-5454
0007	7 SMAGOVIC, W.	665-9929
0008	8 GROGAN, W.J.	683-2128
0009	9 GROPPER, S.	431-8529
0010	10 HARRIS, J.C.	749-7529
0011	11 JONES, C.A.	368-5822
0012	12 ZACHARIAS, M.Z.	247-0918
SORT	4 18 (BY NAME)	
LIST		
0001	6 ABRAHAMS, B.J.	334-5454



```

390 I=I-M
400 IF I=>1 THEN 300
410 J=J+1
420 IF J>K THEN 250
430 GOTO 290
440 *
450 PRINT 'SORT DONE, 'C' COMPARISONS & 'S' SWAPS.'
460 FOR Z=61-C TO -3 STEP -1
470 PRINT
480 NEXT Z
482 PRINT TAB(19)'TABLE 2. DATA SEQUENCES'
483 PRINT TAB(4)'STEP' TAB(23)'Array Position'
485 PRINT USING 530, 'No.', '-1-', '-2-', '-3-', '-4-', '-5-', '-6-', '-7-', '-8-', '-9-', '-10-'
490 FOR P=1 TO C
500 PRINT USING 530, P, B(P,1), B(P,2), B(P,3), B(P,4), B(P,5), B(P,6), B(P,7), B(P,8), B(P,9), B(P,10)
510 NEXT P
520 STOP
530 :   ###   ###   ###   ###   ###   ###   ###   ###   ###   ###
>FAST
10:02 SEP 16 LKEYSORT2...
278 25 47 27 69 240 6 95 180 5

```

ADJUST PAPER TO LINE 3 OF NEW PAGE  
WHEN READY, GIVE RETURN.  
?

## LISTING 2

SYST

APPLE V2.6

#D1800 19BC LENGTH BYTE END OF RECORD EOR LB 4 ASCII DECIMAL DIGITS OF RECORD NO.

1800	25	30	30	30	31	20	31	20	41	52	42	55	54	48	4E
1810	4F	54	2C	20	43	2E	20	20	20	20	20	32	35	32	2D
1820	38	37	36	31	0D	25	30	30	30	32	20	32	20	57	49
1830	4C	4C	49	41	4D	53	2C	20	4A	2E	20	20	20	20	20
1840	20	39	37	39	2D	30	35	34	31	0D	25	30	30	30	20
1850	20	33	20	4A	41	4D	45	53	2C	20	52	2E	53	2E	20
1860	20	20	20	20	20	20	38	33	32	2D	34	35	35	33	0D
1870	30	30	30	34	20	20	34	20	52	4F	4E	41	4C	44	53
1880	4E	2C	20	41	2E	53	2E	20	20	20	37	37	35	2D	34
1890	34	39	38	0D	25	30	30	30	35	20	20	35	20	4A	4F
18A0	4E	53	4F	4E	2C	20	52	2E	4A	2E	20	20	20	20	20
18B0	36	38	36	2D	35	38	31	38	0D	25	30	30	36	20	20
18C0	36	20	41	42	52	41	48	41	4D	53	2C	20	42	2E	4A
18D0	20	20	20	20	20	33	33	34	2D	35	34	35	34	0D	25
18E0	30	30	37	20	20	37	20	53	4D	41	47	4F	56	49	43
18F0	20	4E	2E	20	20	20	20	20	20	20	36	36	35	2D	39
1900	32	39	0D	25	30	30	30	38	20	20	38	20	47	52	4F
1910	41	4E	2C	20	57	2E	4A	2E	20	20	20	20	20	20	36
1920	38	33	2D	32	31	32	38	0D	25	30	30	30	39	20	39
1930	20	47	52	4F	50	50	45	52	2C	20	53	2E	20	20	20
1940	20	20	20	20	34	33	31	2D	38	35	32	39	0D	25	30
1950	31	30	20	31	30	20	48	41	52	52	49	53	2C	20	4A
1960	43	2E	20	20	20	20	20	20	20	37	34	39	2D	37	35
1970	39	0D	25	30	30	31	31	20	31	31	20	4A	4F	4E	45
1980	2C	20	43	2E	41	2E	20	20	20	20	20	20	20	33	36
1990	38	2D	35	38	32	32	0D	25	30	30	31	32	20	31	32
19A0	5A	41	43	48	41	52	49	41	53	2C	20	4D	2E	5A	2E
19B0	20	20	20	32	34	37	2D	30	39	31	38	0D	01	END OF FILE MARKER	

0002	1	ARBUTHNOT, C.	252-8761
0003	8	GROGAN, W.J.	683-2128
0004	9	GROPPER, S.	431-8529
0005	10	HARRIS, J.C.	749-7529
0006	3	JAMES, R.S.	832-4553
0007	5	JOHNSON, R.J.	686-5818
0008	11	JONES, C.A.	368-5822
0009	4	RONALDSON, A.S.	775-4498
0010	7	SMAGOVIC, W.	665-9929
0011	2	WILLIAMS, J.	979-0541
0012	12	ZACHARIAS, M.Z.	247-0918

SORT 23 8 (BY TEL. NO.)

LIST			
0001	12	ZACHARIAS, M.Z.	247-0918
0002	1	ARBUTHNOT, C.	252-8761
0003	6	ABRAHAMS, B.J.	334-5454
0004	11	JONES, C.A.	368-5822
0005	9	GROPPER, S.	431-8529
0006	7	SMAGOVIC, W.	665-9929
0007	8	GROGAN, W.J.	683-2128
0008	5	JOHNSON, R.J.	686-5818
0009	10	HARRIS, J.C.	749-7529
0010	4	RONALDSON, A.S.	775-4498
0011	3	JAMES, R.S.	832-4553
0012	2	WILLIAMS, J.	979-0541

SORT 1 2 (BY ACCESSION NO.)

LIST			
0001	1	ARBUTHNOT, C.	252-8761
0002	2	WILLIAMS, J.	979-0541
0003	3	JAMES, R.S.	832-4553
0004	4	RONALDSON, A.S.	775-4498
0005	5	JOHNSON, R.J.	686-5818
0006	6	ABRAHAMS, B.J.	334-5454
0007	7	SMAGOVIC, W.	665-9929
0008	8	GROGAN, W.J.	683-2128
0009	9	GROPPER, S.	431-8529
0010	10	HARRIS, J.C.	749-7529
0011	11	JONES, C.A.	368-5822
0012	12	ZACHARIAS, M.Z.	247-0918



**PLEASE NOTE:**

Beginning this month a new format will be used for running listings. In most cases this format will allow the listings to be printed in a larger type size making them more legible and easier to use.

#### LISTING 4

```

0000      *GENERALIZED SUBROUTINE TO SORT FIXED-LENGTH RECORDS INTO ALPHANUMERIC ORDER
0001      *
0002      *
0003      *
0004      *
0005      *
0006      *
0007      *
0008      *
0009      *
0010      *
0011      *
0012      *
0013      *
0014      *
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0016      *
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0019      *
0020      *
0021      *
0022      *
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0042      *
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0059      *
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0065      *
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0067      *
0068      *
0069      *
0070      *
0071      *
0072      *
0073      *
0074      *
0075      *
0076      *
0077      *
0078      *
0079      *
0080      *
0081      *
0082      *
0083      *
0084      *
0085      *
0086      *
0087      *
0088      *
0089      *
0090      *
0091      *
0092      *
0093      *
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0097      *
0098      *
0099      *
0100      *
0101      *
0102      *
0103      *
0104      *
0105      *
0106      *
0107      *
0108      *
0109      *
0110      *
0111      *
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0115      *
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0125      *
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0200      *
0201      *
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0229      *
0230      *
0231      *
0232      *
0233      *
0234      *
0235      *
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0237      *
0238      *
0239      *
0240      *
0241      *
0242      *
0243      *
0244      *
0245      *
0246      *
0247      *
0248      *
0249      *
0250      *
0251      *
0252      *
0253      *
0254      *
0255      *
0256      *
0257      *
0258      *
0259      *
0260      *
0261      *
0262      *
0263      *
0264      *
0265      *
0266      *
0267      *
0268      *
0269      *
0270      *
0271      *
0272      *
0273      *
0274      *
0275      *
0276      *
0277      *
0278      *
0279      *
0280      *
0281      *
0282      *
0283      *
0284      *
0285      *
0286      *
0287      *
0288      *
0289      *
0290      *
0291      *
0292      *
0293      *
0294      *
0295      *
0296      *
0297      *
0298      *
0299      *
0300      *
0301      *
0302      *
0303      *
0304      *
0305      *
0306      *
0307      *
0308      *
0309      *
0310      *
0311      *
0312      *
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0315      *
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0317      *
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0321      *
0322      *
0323      *
0324      *
0325      *
0326      *
0327      *
0328      *
0329      *
0330      *
0331      *
0332      *
0333      *
0334      *
0335      *
0336      *
0337      *
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0340      *
0341      *
0342      *
0343      *
0344      *
0345      *
0346      *
0347      *
0348      *
0349      *
0350      *
0351      *
0352      *
0353      *
0354      *
0355      *
0356      *
0357      *
0358      *
0359      *
0360      *
0361      *
0362      *
0363      *
0364      *
0365      *
0366      *
0367      *
0368      *
0369      *
0370      *
0371      *
0372      *
0373      *
0374      *
0375      *
0376      *
0377      *
0378      *
0379      *
0380      *
0381      *
0382      *
0383      *
0384      *
0385      *
0386      *
0387      *
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PAB9 B5      1620 NOTI DCR B      Decrement count.
PABA C2 B3 FA 1670      JNZ LOOP      Continue.
PABD C9      1640      JNZ LOOP      Continue.
FABE         1650 *
FABE         1660 *XFER loads the start addresses of cell (I) and cell (J) into
FABE         1670 *DE and HL respectively, and then does the swap.
FABE         1680 *the number of bytes to be swapped is loaded from
FABE         1690 *CELSZ into the counter, B.
FABE E5      1700 XFER PUSH H
FABF D5      1710      PUSH D
FAC0 C5      1720      PUSH B      Save variables
FAC1 3A F6 FA 1730 LDA HDRSZ      Load hdr size
FAC4 47      1740 MOV B,A      and save in temp. storage.
FAC5 3A F3 FA 1750 LDA CELSZ      Get record length.
FAC8 90      1760 SUB B      subtract hdr size so as not to swap hdrs,
FAC9 47      1770 MOV B,A      and save difference as byte counter.
FACA 2A EE FA 1780 XFER2 LHLD CRCEL      Get address of cell (I)
FACD EB      1790 XCHG      Get address of cell (I)
FACD 2A F0 FA 1800 LDA CRCL1      Get address of cell (L).
FAD1 1A      1810 XFER3 LDAX D      Starts the actual swap.
FAD2 4F      1820 MOV C,A      Char(I)-->C reg
FAD3 7E      1830 MOV A,M
FAD4 12      1840 STAX D      Char(L) replaces char(I)
FAD5 71      1850 MOV M,C      Char(I) replaces char(L)
FAD6 13      1860 INX D
FAD7 23      1870 INX H      Bump pointers
FAD8 05      1880 DCR B      Decrement byte count
FAD9 C2 D1 FA 1890 JNZ XFER3      Loop till done
FADC C1      1900 POP B
FADD D1      1910 POP D      Restore the variables
FADE E1      1920 POP H
FADF C9      1930 RET
FAE0         1940 *
FAE0         1950 *
FAE0         1960 *SCOMP is a comparison routine to handle no-parity strings (bit 7=0).
FAE0         1970 *The sort field length is passed in B, and the result is
FAE0         1980 *returned in A. A=0 if SDE<SHL, A=0 if SDE=SHL, and
FAE0         1990 *A>0 if SDE>SHL. The high-order bytes are weighted by
FAE0         2000 *comparing them before the low-order bytes.
FAE0 B5      2010 SCOMP DCR B      Decrement byte count;
FAE1 FA EB FA 2020 JM DONE      All byte pairs compared.
FAE4 1A      2030 LDAX D      Get a byte from sort field (I)
FAE5 96      2040 SUB M      Subtract corresponding byte from sort field (L).
FAE6 13      2050 INX D      Bump the
FAE7 23      2060 INX H      pointers.
FAE8 CA E0 FA 2070 JZ SCOMP      If bytes equal, go test next pair.
FAEB C9      2080 DONE RET      Return with result in A
FAEC         2090 *
FAEC         2100 *
FAEC         2110 *THIS IS THE PARAMETER BLOCK:
FAEC 00 00      2120 START DW 0      Reference point from which displacements are measured.
FAEC 00 00      2130 CRCL DW 0      Address of record specified by variable I.
FAEC 00 00      2140 CRCL1 DW 0      Address of record specified by variable L.
FAF2 00      2150 NCELS DB 0      Number of records in table.
FAF3 00      2160 CELSZ DB 0      Record length (in bytes).
FAF4 00      2170 SORTL DB 0      Length of sort field.
FAF5 00      2180 PBNUM DB 0      Displacement of sort field from start of record
FAF6 00      2190 *(or from end of header if HDRSZ is non-zero).
FAF6 00      2200 HDRSZ DB 0      No. of bytes in record header (6 for files, 0 for symbat).
FAF7 00 00      2210 EXIT DW 0      Address of routine to be executed on completion of sort.
FAF9         2220 *
FAF9         2230 *THESE ARE THE EQUATES:
FAF9         2240 NOLA EQU 1098H      No. of labels; this value goes to NCELS.
FAF9         2250 EXEC EQU 0A7H      Exit to SCS Executive
FAF9         2260 SYMT EQU 1123H      Start address of symbol table.
FAF9         2270 PSYM EQU 0D72H      Address of Symbol Table pointer.
FAF9         2280 ADR EQU 5B9H      SCS routine to add A to HL.

```

### LISTING 5

```

FB00      0010 *DRIVER FOR SORTING RECORDS IN A STANDARD SPKG 1 FILE
FB00      0010 *                               VERSION 1.0, 8/22/77
FB00      0020 *                               by Chris Terry
FB00      0030 *
FB00      0040 *This driver obtains or computes all the parameters required
FB00      0050 *by the SORT routine for sorting records contained in a

```



```

FA41 0728 *record (I) and record (L). The computed addresses are
FA41 0738 *stashed in CRCEL and CRCL1, respectively, for use by the
FA41 0748 *compare (COMP) and swap (XFER) routines.
FA41 0758 *
FA41 0768 *All variables are saved on entry and restored on return.
FA41 E5 0778 DISPI PUSH H
FA42 D5 0788 PUSH D
FA43 C5 0798 PUSH B
FA44 78 0808 MOV A,B Load I as multiplier
FA45 CD 9F FA 0818 CALL SETAD Compute address of record (I)
FA48 22 EE FA 0828 SHLD CRCEL and save it.
FA48 C1 0838 POP B
FA4C D1 0848 POP D
FA4D E1 0858 POP H
FA4E 0868 *Restore & re-save variables, since SETAD uses all regs.
FA4E E5 0878 DISPL PUSH H
FA4F D5 0888 PUSH D
FA50 C5 0898 PUSH B
FA51 78 0908 MOV A,E Load L as multiplier
FA52 CD 9F FA 0918 CALL SETAD Compute address of record (L)
FA55 22 F8 FA 0928 SHLD CRCL1 and save it.
FA58 C1 0938 POP B
FA59 D1 0948 POP D
FA5A E1 0958 POP H
FA5B 0968 *
FA5B E5 0978 COMP PUSH H
FA5C D5 0988 PUSH D
FA5D C5 0998 PUSH B
FA5E 3A F4 FA 1008 LDA SORTL Fetch length of sort field,
FA61 47 1018 MOV B,A and save in B.
FA62 3A F5 FA 1028 LDA PBNUM Fetch no. of prior bytes,
FA65 2A F8 FA 1038 LHLD CRCL1 Fetch addr. of cell (L)
FA68 CD B9 85 1048 CALL ADR Add prior bytes.
FA68 EB 1058 XCHG and save in DE.
FA6C 2A EE FA 1068 LHLD CRCEL Fetch addr. of cell (I)
FA6F 3A F5 FA 1078 LDA PBNUM Reload no. of prior bytes
FA72 CD B9 85 1088 CALL ADR Add prior bytes,
FA75 EB 1098 XCHG Now DE point to sortfld(I) and HL to sortfld(L).
FA76 CD E8 FA 1108 CALL SCOMP Go do the compare,
FA79 C1 1118 POP B return with result in A,
FA7A D1 1128 POP D and restore
FA7B E1 1138 POP H all variables.
FA7C 1148 *
FA7C B7 1158 *
FA7D CA 92 FA 1168 TEST ORA A Set CPU status flags
FA80 CA 92 FA 1178 JZ SORT3 if MINUS or ZERO, then no swap needed
FA83 CD BE FA 1188 JM SORT3 so continue working with variables;
FA86 78 1198 CALL XFER else call the swap routine.
FA87 94 1208 MOV A,B )
FA88 47 1218 SUB H )Set I=I-M
FA89 CA 92 FA 1228 MOV B,A )
FA8C DA 92 FA 1238 JZ SORT3 If new I is zero
FA8F C3 3E FA 1248 JC SORT3 or negative, go process J & K;
FA92 8C 1258 JMP SORT2 else loop to set new L.
FA93 7A 1268 SORT3 INR C Yes, increment J
FA94 B9 1278 MOV A,D Fetch K
FA95 DA 2E FA 1288 CMP C Is J>K?
FA98 C3 3D FA 1298 JC NEWPS Yes, start a new pass;
FA9B 2A F7 FA 1308 JMP SORT1 else continue.
FA9E B9 1318 FINIS LHLD EXIT Job done; find where to go,
FA9F 1328 PCHL and go there.
FA9F 1338 *
FA9F 1348 *
FA9F 1358 *THESE ARE THE SUBROUTINES:
FA9F 1368 *SETAD calls MULT to multiply a variable (out in E, with D=8)
FA9F 1378 *by the cell length, loaded into A. The product appears in HL,
FA9F 1388 *and is the displacement from START to the 1st effective byte
FA9F 1398 *of the record specified by the variable. Note that START
FA9F 1408 *includes an offset for any header bytes (line no., etc.).
FA9F 1418 *The displacement is transferred to register pair DE; then,
FA9F 1428 *after HL have been loaded from START, the displacement is added.
FA9F 1438 SETAD MVI D,8 Clear D
FA9F 1448 MOV E,A Put the variable (the multiplicand) in E.
FA9F 1458 LDA CELSZ Load the cell length (multiplier) into A.
FA9F 1468 CALL MULT Go do the multiplication.
FA9F 1478 XCHG Save the product in DE.
FA9F 1488 LHLD START Load HL with the base address,
FA9F 1498 DAD D and add the displacement.
FA9F 1508 RET HL point to the 1st byte of the record.
FA9F 1518 * record specified by the variable.
FA9F 1528 *
FA9F 1538 *MULT multiplies an 8-bit unsigned variable (in E)
FA9F 1548 *by the 8-bit unsigned record length (in A),
FA9F 1558 *and returns with the product in HL.
FA9F 1568 MULT LXI H,0 Clear product registers.
FA9F 1578 MVI B,8 Set up count.
FA9F 1588 LOOP DAD H Shift partial product left.
FA9F 1598 RLC Rotate multiplier bit.
FA9F 1608 JNC NOT1 Jump if not 1.
FA9F 1618 DAD D Else add multiplicand.

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FB00 0868 *standard file generated by SPKG 1. All records in the
FB00 0878 *file have a 6-byte header consisting of the record-length
FB00 0888 *byte, a 4-digit decimal line number, and a space. The HDRSZ
FB00 0898 *parameter is, therefore, set to 6 by the driver (see figure 1.
FB00 0908 *record layout.
FB00 0918 *All records in the file must have the same length; any record
FB00 0928 *which has short data must be padded to the full length with spaces
FB00 0938 *and terminated with a printing character (e.g., '*').
FB00 0948 *Line numbers must begin at 0001 and increase by 1; if this
FB00 0958 *rule is not followed, the driver will compute an incorrect
FB00 0968 *number of records and the sort will fail.
FB00 0978 *The form of the sort command is:
FB00 0988 *
FB00 0998 * SORT col len
FB00 1008 *where 'col' is the column in which the sort field starts
FB00 1018 *(column 1 being the first column after the header space).
FB00 1028 *and 'len' is the length (in columns) of the sort field.
FB00 1038 *Both values are decimal.
FB00 1048 *During the sort, if variable I has the value 7, then
FB00 1058 *DATA(I) is contained in file line 0007.
FB00 1068 *
FB00 1078 *
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FB00 1118 *
FB00 1128 *
FB00 1138 *
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FB5B      0960 *a 16-bit binary number in DE.
FB5B F5    0970 DECBN PUSH PSW
FB5C C5    0980      PUSH B
FB5D D5    0990      PUSH D      Save initialized index
FB5E 11 00 00 1000      LXI D,0      Clear the result registers.
FB61 7E    1010 LOOP      MOV A,M      Fetch an ASCII decimal digit,
FB62 D6 30 1020      SUI 30H      Convert to BCD,
FB64 83    1030      ADD E      Merge in the partial result,
FB65 5F    1040      MOV E,A      and save it in E.
FB66 C1    1050      POP B      Get index (originally pushed from D),
FB67 05    1060      DCR B      decrement digit count,
FB68 CA 78 FB 1070      JZ FIN      and exit if done,
FB6B C5    1080      PUSH B      else save updated digit count.
FB6C EB    1090      XCHG      Bring result into HL,
FB6D 29    1100      DAD H      multiply by 2,
FB6E E5    1110      PUSH H      and save partial product.
FB6F 29    1120      DAD H      Multiply by 2 again (= x4)
FB70 29    1130      DAD H      and again (= x8).
FB71 C1    1140      POP B      Fetch the x2 into B
FB72 09    1150      DAD B      and add it to the x8 (now = x10),
FB73 EB    1160      XCHG      and put the x10 product back in DE.
FB74 23    1170      INX H      Point to next ASCII digit,
FB75 C3 61 FB 1180      JMP LOOP      and continue.
FB78 23    1190 FIN      INX H      Point to last digit+1.
FB79 C1    1200      POP B      Restore the
FB7A F1    1210      POP PSW      registers and
FB7B C9    1220      RET      return to caller.
FB7C      1230 *
FB7C      1240 *
FB7C      1250 *THESE ARE THE EQUATES:
FB7C      1260 ZBUF EQU 199H
FB7C      1270 VALC EQU 1A6H
FB7C      1280 MAXL EQU 102DH
FB7C      1290 ADEC EQU 234H
FB7C      1300 NCELS EQU 0FAF2H
FB7C      1310 BOFF EQU 1029H
FB7C      1320 CELSZ EQU 0FAF3H
FB7C      1330 ABUF EQU 107EH
FB7C      1340 PBNUM EQU 0FAF5B
FB7C      1350 SORTL EQU 0FAF4H
FB7C      1360 HDRSZ EQU 0FAF6H
FB7C      1370 ADR EQU 5B9H
FB7C      1380 START EQU 0FAECH
FB7C      1390 EOR EQU 0BAH
FB7C      1400 EXIT EQU 0FAF7H
FB7C      1410 SORT EQU 0FA2AH
FB7C      1420 PSW EQU 6
FB7C      1430 SP EQU 6

```

## SYMBOL TABLE

```

ABUF 107E      ADEC 0234      ADR 05B9      BOFF 1029
CELSZ FAF3     DECBN FB5B     EOR 00BA     EXIT FAF7
FIN  FB78     HDRSZ FAF6     LOOP FB61     MAXL 102D
NCELS FAF2     PBNUM FAF5     PSW 0006     SBA  FB50
SORT  FA2A     SORTL FAF4     SP 0006      SRTP FB00
STACK E340     START FAEC     VALC 01A6     ZBUF 0199

```

## LISTING 6

```

FB00      0010 *      FILECHECK
FB00      0020 *      by Chris Terry
FB00      0030 *      Version 1.2, 11/01/77
FB00      0040 *
FB00      0050 *
FB00      0060 *This routine is called from the main command table. It
FB00      0070 *checks the length of line 0001 and then checks to see
FB00      0080 *that all subsequent lines in the currently open file
FB00      0090 *have exactly the same length. If any line has a different
FB00      0100 *length, the line number is stored in a buffer and
FB00      0110 *printed after the last line has been checked.
FB00      0120 *
FB00      0130 *
FB00 CD 01 41 0140 CHECK      CALL CRLF      *Acknowledge the command.
FB03 11 00 D1 0150      LXI D,RERR      *Set pointer to start of error list.
FB06 2A 29 D1 0160      LHLD BOFF      *Get address of line 0001
FB09 46      0170      MOV B,M      *Save length byte of line 0001 for comparisons.
FB0A 7E      0180      MOV A,M      *Fetch length byte of line to be tested;
FB0B FE 01    0190      CPI 1      *Check for end-of-file marker.
FB0D CA AB FB 0200      JZ DONE      *If EOF, go print error list;
FB0E B8      0210      CMP B      *else compare current length byte to
                                *that of line 0001.
FB09 4A 9A FB 0220      CNZ ERR      *If not equal, go store line number;
FB0A CD B9 05 0230      CALL ADR      *else add line length to HL to access next
                                *length byte.
FB07 C3 8A FB 0240      JMP CHK1      *and loop back to test it.
FB0A      0250 *

```

```

0D72      0160 OUT8      EQU 136H      *Outputs a single character to the
                                console
0D72      0170 ASPC      EQU 1092H     *Convenient 2-byte scratch pad
0D72      0180 HOUT      EQU 26DH      *Converts binary value in A to 2
                                hex digits & outputs them
0D72      0190 BLK1      EQU 290H      *Outputs a single ASCII space to console
0D72      0200 *****
0D72      0210 *
0D72      0220 *SETUP AND HEADER PRINTING:
0D72      0230 PSYM      LDA NOLA      *Get number of labels
0D72      0240      CPI 0      *If none,
0D72      0250      JZ EOR      *go to Exec;
0D72      0260      STA COUNT      *else save count.
0D72      0270      LXI H,HEAD      *Point to heading
0D72      0280      CALL CRLF      *and space down
0D72      0290      CALL CRLF      *two lines.
0D72      0300      CALL SCRNL      *Print heading and
0D72      0310      CALL CRLF      *another blank line.
0D72      0320      MVI D,0      *Initialize labels-per-line count.
0D72      0330 *
0D72      0340 *MAIN PROGRAM LOOP STARTS HERE:
0D72      0350 PSYM1     MVI C,5      *Initialize characters-per-label count
0D72      0360      MOV A,D      *Examine label count for this line
0D72      0370      ANI 3      *If more than three printed
0D72      0380      CZ CRLF      *start a new line;
0D72      0390      INR D      *else bump label count.
0D72      0400 *
0D72      0410 *OUTPUT A LABEL:
0D72      0420 LOOP      MOV A,M      *Get a byte from table
0D72      0430      MOV B,M      *and save in B for output.
0D72      0440      CPI 0      *If it's not a zero filler
0D72      0450      JNZ OVER      *go output it;
0D72      0460      MVI B,' '      *else replace zero in B by an ASCII space.
0D72      0470      CALL OUT8      *Output the character in B.
0D72      0480      INX H      *Bump the pointer up
0D72      0490      DCR C      *and the chars-per-label count down.
0D72      0500      JNZ LOOP      *If 5-character label not finished, loop;
0D72      0510      MVI B,' '      *else load a space
0D72      0520      CALL OUT8      *and output it.
0D72      0530 *
0D72      0540 *OUTPUT ADDRESS ASSOCIATED WITH LABEL:
0D72      0550      MOV A,M      *Get first address byte.
0D72      0560      SHLD ASPC      *Save table pointer
0D72      0570      CALL HOUT      *Convert byte to 2 ASCII hex digits and
                                output them.
0D72      0580      LHLD ASPC      *Restore table pointer,
0D72      0590      INX H      *bump it up,
0D72      0600      MOV A,M      *and get 2nd address byte.
0D72      0610      SHLD ASPC      *Save pointer.
0D72      0620      CALL HOUT      *Convert and output 2nd address byte.
0D72      0630      LHLD ASPC      *Restore pointer
0D72      0640      INX H      *and bump it.
0D72      0650 *
0D72      0660 *OUTPUT 4 SPACES BEFORE NEXT LABEL:
0D72      0670 SPACE     MVI A,4      *Initialize space count
0D72      0680      CALL BLK1      *Output a space
0D72      0690      DCR A      *Bump counter
0D72      0700      JNZ SPACE      *If not done, output another space;
0D72      0710 *
0D72      0720 *UPDATE LABEL COUNT:
0D72      0730 LABUP     LDA COUNT      *Get label count
0D72      0740      DCR A      *decrement it
0D72      0750      STA COUNT      *and save updated count.
0D72      0760      CPI 0      *If count not yet zero,
0D72      0770      JNZ PSYM1     *loop back to continue line;
0D72      0780 *
0D72      0790 *THIS IS THE END OF THE MAIN PROGRAM LOOP
0D72      0800 *****
0D72      0810 *
0D72      0820 *THIS IS THE CLEAN-UP ROUTINE:
0D72      0830 END      CALL CRLF      *Output two
0D72      0840      CALL CRLF      *blank lines.
0D72      0850      MVI B,12H      *Load a Form-Feed for Diablo printer,
0D72      0860      CALL OUT8      *and output it to printer.
0D72      0870      JMP EOR      *Return to SCS Executive; all done.
0D72      0880 HEAD      ASC 'SYMBOL TABLE'
0D72      0890      DB 0DH      *CR to terminate header.
0D72      0900 COUNT     DB 0      *Temporary storage for label count.
0D72      0910 *****

```

## SYMBOL TABLE

```

BLK1 0290      CRLF 0141      E TO 5052      END 0DD8
EOR 00BA      HEAD 0DE6      HOUT 026D      INT T 4845
LABUP 0DCC     LOOP 0D97      NOLA 1098      OUT8 0136
OVER 0DA8      PSYM 0D72      PSYM1 0DBE      SCRNL 02AD
SPACE 0DC3      SYMT 1123

```



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```

0260 *****
0270 *
0280 *This subroutine copies the line number of a bad line into
0290 *the error list buffer, when checking is complete, an EOF
0300 *is placed in the first free location of the buffer.
0310 ERR      PUSH    H
0320          PUSH    B
0330          PUSH    B,4
0340          MVI     H
0350          MOV     A,M
0360          STAX    D
0370          INX     D
0380          DCR     B
0390          JNZ     ERR1
0400          POP     PSW
0410          POP     B
0420          POP     H
0430          RET
0440          *All done, return to check another line.
0450 *****
0460 *
0470 *Get to DONE when the CHK1 routine finds an EOF marker.
0480 *The EOF is deposited in the error buffer to terminate it;
0490 *then each 4-digit line number in the buffer is printed and
0500 *is followed by a CRLF. Buffer scanning stops when the
0510 *EOF is found.
0520 *
0530 DONE      STAX    D
0540 PERR       LXI     H,RERR
0550 PERR1      MOV     A,M
0560          CPI     1
0570          JZ      NERR
0580          MVI     C,4
0590          MOV     B,M
0600          CALL    OUT8
0610          INX     H
0620          DCR     C
0630          JNZ     PERR2
0640          CALL    CRLF
0650          JMP     PERR1
0660 *****
0670 *
0680 *This routine prints the final message and returns
0690 *control to the Executive.
0700 *
0710 NERR       LXI     H,RMSG
0720          CALL    SCRNL
0730          JMP     EOR
0740 *
0750 RMSG       ASC     'ALL ERRORS LISTED'
0760 RMSG1      DB      0DH
0770 *****
0780 *
0790 *THESE ARE THE EQUATES:
0800 RERR       EQU     0D100H
0810 ADR        EQU     5B9H
0820 SCRNL      EQU     2ADH
0830 EOR        EQU     0BAH
0840 BOFF       EQU     1029H
0850 *****

```

## SYMBOL TABLE

ADR	05B9	BOFF	1029	CHECK	PB80	CHK1	PB8A
DONE	PB8B	EOR	00BA	ERR	PB9A	ERR1	PB9F
NERR	PB8C	PERR	PBAC	PERR1	PBAF	PERR2	PBB7
RERR	D100	RMSG	PBCF	RMSG1	PBE0	SCRNL	02AD

## LISTING 7

```

0072 * ROUTINE TO PRINT THE SYMBOL TABLE OF THE INSAI SCS
0072 * By J.J. Cotton
0072 * Version 2.1, 09/04/77
0072 *
0072 *This routine is called upon completion of the symbol table
0072 *sort, or can be called directly by SPKG 0.5 command PS to
0072 *print the symbol table at any time. A number of the SCS
0072 *conversion and outputting subroutines are called.
0072 *
0072 *THESE ARE THE EQUATES:
0072 0110 NOLA      EQU     1098H
0072 0120 EOR       EQU     00BAH
0072 0130 CRLF      EQU     141H
0072 0140 SCRNL     EQU     2ADH
0072 0150 SYMT      EQU     1123H

```



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CIRCLE INQUIRY NO. 89

# NORTHSHARE

## A Multiuser an 8080 or Z80

### INTRODUCTION

The 8080 and Z80 microprocessors can directly address 64K bytes of memory (0000 to FFFF HEX) and have 256 addresses available for peripherals (00 to FF HEX). Computers with a front panel usually use address FF HEX for the switches and lights, and floppy disk interfaces may utilize several more of the addresses. This still leaves room for many additional things such as a video terminal, a line printer and a tape recorder.

It is customary to allocate two addresses for terminals. One (the data port) is used for the transfer of information, both in and out. The other (the status port) is used to determine the condition of the data port. A typical output routine might look like this:

8000	DB00	OUTT:	IN	CSTAT	;GET CONSOLE STATUS
8002	E640		ANI	OMASK	;MASK FOR OUTPUT
8004	CA0080		JZ	OUTT	;LOOP UNTIL READY
8007	79		MOV	A,C	;GET THE BYTE
8008	D301		OUT	CDATA	;PRINT IT
800A	C9		RET		

OUTT is the output subroutine for the console, CSTAT is the address of the status register, CDATA is the address of the data register, and OMASK selects the proper bit. During output, the computer checks the status register to see if the last byte that was sent has been printed. One of the bits of the status register is used for this purpose. If the terminal is not ready, the computer continually executes the first three instructions shown above until the terminal is ready.

The 8080 usually operates at 2 megahertz (MHz) and the Z80 at 2 or 4 MHz. At these speeds, the microcomputer is operating much faster than the peripheral. This is especially so for a Teletype which runs at 10 characters per second or a DECwriter that works at 30 characters per second. The result is that the computer is doing nothing useful while it is looping more than 99% of the time. Because of its speed, the computer can, in principle, operate many printers simultaneously. Instead of reading the status register of a single terminal, a computer can poll several in sequence. If one terminal is not ready, the computer goes on to the next.

It is possible to design a multiuser system by utilizing this difference in speed between the computer and the terminals. This means that several different users can simultaneously solve problems (or play games) on their individual terminals, using the same computer. MITS recently released a multiuser disk BASIC, and the



# Disk BASIC for Microcomputer

Review by Alan R. Miller,  
Contributing Editor

Clairemont High School Computer Club of San Diego has announced several time-sharing packages using BASIC, assembly language, and some other languages.

## THE BYTE SHOP MULTI-USER BASIC

A disk BASIC that can operate up to four different terminals is available from the Byte Shop of Westminster for \$48 plus shipping. The package comes on a North Star diskette that contains the operating system, the regular North Star extended disk BASIC, and two programs that are used to tailor the peripheral routines to your terminals. You need a minimum of 24K bytes of memory starting at 2000 HEX. Any additional memory can be allocated among the terminals.

Startup couldn't be easier; just follow the instructions. You boot up your regular North Star DOS in the usual way, switch to the NORTHSHARE diskette, and type:

```
GO BASIC
LOAD NORTHGEN
RUN
```

By using the sample run at the back of the manual, you now configure the diskette to your system. You set the number of time-sharing terminals, allocate the memory space for each, and set the size of the input and output buffers. Then you enter the particulars for each terminal interface: the addresses of the status and data registers, the bits that indicate input ready and output ready, and whether the bit is high or low when ready. If you are revising the table, you can type a carriage return if the data that is shown is correct. Finally, you can enter a computer program that will initialize the terminal ports if this is necessary.

Along the way, you are asked if you want to update the disk. Answer yes. The sample run of NORTHGEN, shown at the back of the manual gives all the user commands in lower case. When I tried using lower case, the program wouldn't accept it. Perhaps the difference is in the personalized DOS routines.

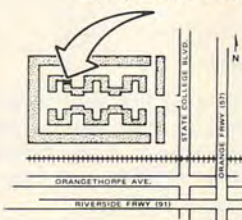
Although it doesn't say so in the manual, you type a Control-C when you have finished personalizing NORTHSHARE. This returns you to BASIC. Then exit to DOS and reboot:

```
Control-C
BYE
JP E800
```

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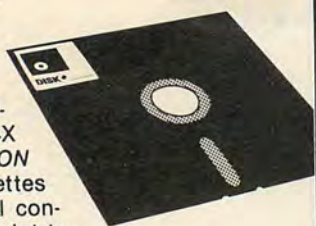
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## SOFTWARE SECTION

If the diskette was properly configured, BASIC will now start up, and all terminals will simultaneously print READY. When I went through this sequence with a 110-baud Teletype, a 300-baud thermal printer, and a 9600-baud video terminal, all came up just fine.

The first thing I did was type:

PRINT SQRT(2)

on each terminal, and each responded with the correct answer. Then I wrote a short program on each terminal and ran it:

```
10 FOR I = 1 TO 500
20 PRINT % 71, I, I*I,
30 PRINT % 13E3, 1/I,
40 PRINT % 8F4, SQRT(I),
50 PRINT % 11F3, LOG(I)
60 NEXT
RUN
```

Each of the terminals began printing out the requested information. The hardcopy terminals were clearly running at their usual (relatively slow) speed. The video terminal was running at about the same speed as the hardcopy terminals. There was clearly a noticeable slowdown in the response to input for all terminals. This shouldn't be a problem, however, except for the fastest typists.

## SAVING PROGRAMS ON DISK

Programs are saved on disk in the usual way. One user at a time can exit to DOS with the command BYE, create a file with the commands CR and TY, and then return to BASIC with the command BA. (If you return with the command BI, the existing program is erased.) Your BASIC program is then saved with the SAVE command.

Only one terminal can be in DOS at a time. If a user tries to exit to DOS while another user is there, a message is printed indicating that DOS is busy and to try again later.

Most of the North Star DOS and BASIC commands can be used with NORTHSHARE. The exceptions are the DOS commands DT and IN which affect the entire disk and the BASIC PRINT # commands that use other terminals. Also, memory-mapped terminals such as the Processor Tech VDM can't be used.

## POSSIBLE PROBLEMS

There is no built-in memory protection. Any user can clobber any other with the FILL command. On the other hand, users can communicate through the FILL and EXAM commands. The CALL command can be used to branch to a machine-language subroutine. However, overall performance can be seriously degraded if too much time is spent this way. This is because all other terminals cease operation during the CALL.

The NORTHGEN program would be easier to use if the user could input all data in hexadecimal. As it's currently written, some data is input in decimal, others in HEX. For example, memory size for each terminal is entered in decimal, but total memory size is entered in HEX. Fortunately, the terminal and port data are entered in HEX.

## CONCLUSION

As more and more good software becomes available, less time is being spent writing original programs and more time interfacing to other people's work. CP/M and Electric Pencil that have been reviewed here recently are prime examples. NORTHSHARE can be put in this same category. □



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## FOR YOUR NORTH STAR

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# MISSION CONTROL





# Beep-A-Bug

By Donald Fitchhorn

Business Programmer, MITS® Computing Services Department  
Microsystems Division, Pertec Computer Corporation  
Los Angeles, California

Remember the last time you left a "debugged" program running and went off to do something else while it solved your problems for you? Sure you do. You came back an hour later only to find an inactive computer silently displaying:

```
NEXT WITHOUT FOR IN 330
OK
```

An entire hour was wasted while you thought your program was working. This could have been avoided if the computer had signaled you that the program had stopped.

Maybe you have a program that runs for a while unattended and then has to stop and wait while you change a tape or type in more data. This also wastes your time if you are not sure just how long the first part of the program takes.

These two conditions are prime candidates for a little <<BEEP>> <<BEEP>> routine: a short subroutine that beeps (like an electronic digital alarm) until someone comes to see what it wants.

The basic subroutine consists of four lines:

```
10000 CONSOLE18,0
10010 FOR I=1 TO 100:
  IF (INP(16) AND 1)
    THEN I=100:NEXT
  ELSE NEXT:OUT17,7:OUT17,0:GOTO10010
10020 CONSOLE16,0
10030 RETURN
```

Line 10000 tells BASIC not to look for input from the terminal for a while. Line 10010 performs three functions:

1. It checks to see if a key has been hit on the terminal.
2. It performs function 1 one hundred times to provide a delay between beeps.
3. It tells the terminal to beep.

Line 10020 is reached if a key is hit on the terminal while the program is executing line 10010. It instructs BASIC to look at the terminal. Line 10030 returns back to your BASIC program.

If you are interested in having BASIC execute the beep routine when it sees an error, you will need a line in your program that forces BASIC to let your program handle errors. This statement should be after the CLEAR statement, if there is one in the program. The line will look something like this:

```
70 ON ERROR GO TO 10000
```

This line tells BASIC to GOTO 10000 if it encounters an error anywhere in the program. Change line 10030 to read:

```
10030 ON ERROR GO TO 0
```

This instructs BASIC to print the error that caused the beep routine to be executed. Example 1 illustrates how this works.

## EXAMPLE 1

```
10 CLEAR 100
.
.
.
70 ON ERROR GOTO 10000
.
.
.
300 FOR I=1 TO 10
310 PRINT I;
320 NEXT
330 NEXT
.
.
.
10000 CONSOLE18,0
10010 FOR I=1 TO 100:
  IF (INP(16) AND 1)
    THEN I=100:NEXT
  ELSE NEXT:OUT17,7:
    OUT17,0:GOTO10010
10020 CONSOLE16,0
10030 ON ERROR GOTO 0
```

RUN

```
1 2 3 4 5 6 7 8 9 10
<<BEEP>> <<BEEP>> <<BEEP>> . . . .
(Type any character)
```

```
NEXT WITHOUT FOR IN 330
OK
# # #
```

These are just two examples of the many ways that Beep-A-Bug can be used. There are other things that can be done with this routine, such as "Top Secret" program protection: beep if someone tries to break through your security. It could also be used as an alarm clock (if you have a Real Time Clock), or possibly as a metronome if you are musically inclined. Use your imagination, and remember: if you make a mistake, Beep-A-Bug will let you know. □



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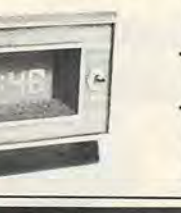
### INTEGRATED CIRCUITS

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4000 CMOS	4000	4001	4002	4003	4004	4005	4006	4007	4008	4009	4010	4011	4012	4013	4014	4015	4016	4017	4018	4019	4020	4021	4022	4023	4024	4025	4026	4027	4028	4029	4030	4031	4032	4033	4034	4035	4036	4037	4038	4039	4040	4041	4042	4043	4044	4045	4046	4047	4048	4049	4050	4051	4052	4053	4054	4055	4056	4057	4058	4059	4060	4061	4062	4063	4064	4065	4066	4067	4068	4069	4070	4071	4072	4073	4074	4075	4076	4077	4078	4079	4080	4081	4082	4083	4084	4085	4086	4087	4088	4089	4090	4091	4092	4093	4094	4095	4096	4097	4098	4099
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FOR SALE: M6800 2-Pass Cross-Assembler in FORTRAN IV. Fixed format input, MIKBUG output. Manual \$1, listing \$5, paper tape \$15. G. Trollope, 466 Caswallen Dr., West Chester, PA 19380.

FOR SALE: Heath H11 with 16KB RAM, serial I/O board, parallel I/O board, H10 paper tape reader/punch, EIS/FIS extended instruc. chip, docu., software. Assem. & tested. \$1800 or best. Dave Morrill, 1260 NW 17 Ave., #4, Rochester, MN 55901, (507) 282-0758 eve.

FOR SALE: Apple II software — cassette + docu. — disk-compatible catalog prog. (e.g., author-title index or disk prog. index), can fetch prog. names from D\$CATALOG, \$10; Auto Save/Restore disk to backup tape, \$5; Graphic Black-jack, paddle-input, auto-play mode, \$10. Any 2/\$15. All 3/\$18. George W. Lee, 18803 S. Christina Ave., Cerritos, CA 90701.

FOR SALE: PET Computer Software. Cassette tape program and documentation allows use of any PET computer as a data terminal. No hardware modifications needed. Provides serial TTL Tx and Rx data, adjustable for 0-600 baud. Tape and instructions, \$22. Roger Bracht, 803 11th St., Rapid City, SD 57701.

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